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AIR-SHIPS AND FLYING-MACHINES.

BY A. SANTOS DUMONT.

On my journey from France to America, on board the "Deutschland," I occupied my leisure in reading the interesting book by Mr. H. G. Wells entitled "When the Sleeper Awakes: a Story of the Years to Come," and in putting on paper some reflections suggested by the two chapters which principally claimed my attention: "While the Aëroplanes were Coming" and "The Coming of the Aëroplanes."

That which always strikes me in books of this sort is the effort of imagination put forth by the authors in discerning in the distant future things which to-day lie under the very eyes of men more practical or less near-sighted, who know how to look at the things which are close to them.

Mr. H. G. Wells speaks of aërial navigation as men talked of automobile locomotion about ten years ago, believing that they predicted the future without suspecting that they spoke of the present. They were far from thinking that, at the end of the nineteenth century, carriages propelled by petroleum, by steam, by electricity, comfortable and rapid, would be speeding over all the roads of the world.

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À propos of "horseless carriages," as automobiles were at first called, being defined by their negative qualities, people said: "Our nephews will perhaps see them, but not we." The reality has transcended the dream, and the practical automobile has come before the nephews have had time to fill their uncles' places.

Again I am astonished to see that, in the field of aëronautics, the ideas of dreamers, as opposed to those of scientific men, turn exclusively to what they call aëroplanes—that is to say, toward flying-machines, which as yet exist only in the future, and which raise themselves, or to speak more accurately, will raise themselves, without the assistance of any gas lighter than air. They *do not perceive that from now on, the air-ship furnishes a solu*tion of the problem of aërial navigation, and realizes without difficulty the first condition of every system of aërial motion—which is to float in the air, carrying with it its aëronaut; although flying-machines without a balloon have been, until now, only toys, not capable of carrying a man or even of supporting their own weight in the air more than a few minutes.

Certainly the time will come when, thanks to the development of light motors, man will be able to travel like the birds, borne without gas by vast aëroplanes. But the best means of arriving at this result is by the construction of many air-ships and by frequent tests, made not under cover but in the open air.

People err in continually opposing, as they do without reflection, "aërostation," whose principle requires a combination of materials which is lighter than the air displaced by it, to "aviation," which involves a combination heavier than the air.

As a matter of fact in the air-ship—such, for instance, as my "No. 6"—both principles are employed. The balloon, in the form of a spindle, measuring thirty-three metres in length and six metres in diameter in the middle, is heavier than the air, since it does not rise of itself when the propeller is stopped. My air-ship is nothing else than a sort of tubular aëroplane, into whose construction enters hydrogen gas under pressure, which keeps tense its vast surface, with the least possible weight of materials. I use hydrogen as a constituent part of the tubular aëroplane to insure the rigidity of its fabric, in place of a solid frame-work which would not produce for the moment the same effect without the greatest difficulty. For the same reason, for certain pieces of mechanism which do not demand the re-

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sistant qualities of steel, I use aluminum, which, next to hydrogen, is the lightest substance known to industry: for the same reason, also, with the constant aim of diminishing the weight of the mechanism, I have adopted, as an essential part of the armored frame-work which supports the car and the aëronaut, a combination of pieces of pine-wood bound together by metallic threads so fine that they weigh almost nothing. So I was able to construct, in tubular form, the only aëroplane which has ever succeeded in raising itself and its aëronaut while remaining heavier than the air, about twenty kilogrammes being supported by the dynamic action of the propeller.

Nature sets us the example of this economy of weight in making hollow the quills of the feathers of birds, which must be at once light and solid—in making even their bones hollow, substituting air for the marrow of the bones of terrestrial animals.

If I were content to affirm the necessity of an apparatus heavier than the air, without at the same time insisting upon replacing by hydrogen, by aluminum and by threads of steel the heavy materials hitherto employed in the construction of flying-machines, I could have produced in a thousand different ways an aëroplane heavier than the air—so heavy that, like so many others, I should have remained on the ground, instead of flying around the lightning-rod of the Eiffel Tower.

Persuaded that the principle of aërostation and that of aviation do not in the least degree exclude each other, I have sought to unite them in the same mechanism, and, so doing, I think I have reconciled the two opposing schools of thought, which have struggled on paper, with no benefit to science, for the last hundred years. During four years of uninterrupted work, I have forced myself to solve practically the two fundamental problems, the equilibrium and the direction of balloons, deriving the ascensional force at the same time from the static action of the hydrogen and from the dynamic action of the screw.

With this end in view, I ballast my machine sufficiently to make it heavier by some pounds than the weight of the volume of air which it displaces. It cannot raise itself by the unaided effort of the hydrogen. From the propeller I demand the complement of necessary force. That is so real a factor, that, when I stop the motion of the propeller, the air-ship descends gently toward the earth by its own weight.

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This is the method by which I regulate, at my pleasure, the ascension and the equilibrium of the mechanism. At the bow of the air-ship is attached a guide-rope, weighing a hundred pounds and sixty yards in length. Under these conditions, the contents are distributed from one end to the other of the air-ship, so that the axis of the frame-work, which is also that of the screw, may be perceptibly parallel to the horizon.

Near the middle of the guide-rope, is attached to it the end of a small cord which is under the control of the aëronaut, and thus permits him to bring the weight of the guide-rope, more or less, toward the centre of gravity of the mechanism.

At the moment of departure, I pull upon the cord; the guide-rope is thus brought toward the centre, and the bow of the air-ship, relieved of a part of its weight, rises at the same time that the stern lowers itself; for the entire mechanism is rigid owing to the pressure of the hydrogen.

The screw then acts at the extremity of an axis inclined obliquely to the horizon. Its action is diverse. It not only propels the air-ship, but causes it to mount, following the inclined plane which contains its axis in space. To arrest the upward motion and to adjust the air-ship to the altitude which I desire to maintain, I direct its axis toward the horizontal plane by allowing the guide-rope to return, more or less, toward the bow. If I desire to descend, all that is necessary is to let the guide-rope return to its normal position, that which it held before the start. Besides, I have, in the frame-work, bags of ballast, which I can move by means of small cords, for the purpose of lowering the bow of the air-ship and descending more quickly.

In a word, I can move myself in a vertical direction, without getting rid of the ballast and without loss of hydrogen, by simply varying the inclination of my tubular aëroplane of hydrogen under pressure.

My air-ship differs, then, essentially from the ordinary balloon, which mounts or descends only by losing either ballast or gas—that is to say, by the rapid exhaustion of its means of aërial existence.

The air-ship which I have invented has certainly more resemblance to an aëroplane, properly so called, than to a balloon. I hope to make the resemblance closer still, and even to arrive at a complete identification of the air-ship and the flying-machine,

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by supplying the future numbers of the series of my air-ships with inclined planes, whose surface, added to that of the envelope of the balloon, will act in union with it, under the propulsive action of the screw, in supporting the weight of the mechanism.

I am beginning even now to perfect my "No. 6," adding to it, for the experiments which I expect to make in London in June, inclined planes which, placed toward the bow of the air-ship, will have the effect not only of lifting the ship but of correcting its pitching motion.

If, as I hope, I obtain good results, the speed will be perceptibly greater than that which I realized between Saint-Cloud and the Eiffel Tower.

Beginning with this year, I shall attempt to apply in the air the principles of aviation properly so called, by subjecting my air-ships to a continual evolution.

In the same proportion that I increase the extent of the inclined planes symmetrically disposed at the right and left, I shall reduce the surface of the envelope of varnished silk, and, consequently, the volume of hydrogen relatively to the power of the motor.

Thus I expect gradually to diminish the rôle of the hydrogen, making secondary its importance which is now primary, and even completely doing away with the use of this gas.

The air-ship will then have become an aëroplane in the absolute sense of the word, and I hope that some day we shall see it such. That day is undoubtedly not far distant, but the flying-machine will be achieved only by the way of evolution, by making the air-ship pass through a series of transformations analogous to the metamorphoses by which the chrysalis becomes the winged butterfly.

My air-ship, which raises itself by pushing back the air, has already done better than the chrysalis, whose elongated form it resembles. It may be that very soon nothing will prevent it from freeing itself completely from its cocoon of silk lined with hydrogen, and from being wholly comparable to a butterfly.

The air-ship, then, as it exists to-day, and the aëroplane absolutely without gas, to which we shall come, will form the two extremes of a series of aërial machines between which the aëronaut will have his choice, following his taste or consulting the at-

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mospheric conditions or the length of the course, in selecting the machine, more or less sustained by hydrogen or by the propeller, whichever best responds to his wishes.

For myself, ardently devoted as I am to the captivating study of aviation, I am persuaded that the air-ship, thanks to the hydrogen, will always have an advantage over the aëroplane in being able to carry a great quantity of combustible material for long journeys, a number of travellers, and a considerable weight of merchandise—an advantage which will give it a practical utility unquestionably superior in commerce or in war. On the other hand, the flying-machine will without doubt attain, for short distances, an incomparable speed, the advantages of which will be in certain cases very appreciable—for instance, in crossing a strait like the Strait of Dover, in the journeys of the wealthy, or in the transmission of despatches at a high rate.

But when I think that an air-ship of the length of the Transatlantic steamer "Deutschland," constructed with the proportions of my "No. 6," would transport a thousand voyagers of my own weight, with a sufficiently powerful motor and the necessary amount of petroleum, from New York to Havre in two days, I cannot help finding the dirigible balloon more interesting than the aëroplane from the economic point of view, which is the dominant one in the world of to-day.

This is not the conception of a romancer. It is an affirmation which I can easily make good by figures; and, what is better, it will, I am firmly convinced, within a few years have become an accomplished fact.

Evidently this condition will not make itself, but it will be achieved because there is no conquest to which the entire human race aspires more ardently than to the empire of the air.

To attain this end, a series of tests in the open air will be necessary—tests not contemplated by inventors who, in their distaste for action, confine themselves to sketching vaguely upon paper projects impossible of realization.

Aërial progression will be achieved not in the mysterious recesses of the laboratory, but in the air itself. As the child learns to walk only by trying to walk, so man will learn to fly only by effectually practising flying.

The problem of aërial locomotion, contrary to the tradition which has so long retarded its solution, has no secrets. It de-

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mands only work in full light, in the open air, much perseverance and a little audacity—the audacity of which the swallow sets us an example when it tries its unaccustomed wings for the first time beyond its nest.

One is often astonished that the evolution of the air-ship should have required so many years, when other inventions have been perfected so rapidly. How should the air-ship make progress when in a half-century aëronauts have done nothing to aid it?

The balloon—at first a simple bag of inflated paper over a fire of straw,—created by the genius of Montgolfier, transformed into a silken sphere inflated with hydrogen, metamorphosed into an air-ship by the genius of Henry Gifford, who in 1852 gave the first demonstration of the great problem, having the sublime daring to carry a steam engine in his car—demands now for its final evolution the application of the naphtha motor, which already gives us a single horse power under a weight of six pounds.

When modern industry places at our disposal the treasure of energy stored up in petroleum (10,000 calories transformable into force in one kilogramme of this precious fluid), I ask myself what do the "aviators," torpid with passive waiting for a light motor, demand? And what are the aëronauts doing, spending twenty years in the application to aëronautics of the electric motor, which it is impossible to conceive of as applied to aërial navigation, since, with its generator (battery or accumulator), it is the heaviest of known motors.

More than all I am astonished that empirics, always mired in the ruts of routine, insist obstinately on controlling the spheric balloon only by emptying their sacks of ballast, since it is a buoy as refractory to direction as to equilibrium, over which for more than half a century generations of amateurs and professionals have lost their time.

I think that in the last four years I have demonstrated amply that a petroleum motor does not necessarily set fire to the hydrogen of an air-ship. That is, indeed, among the possibilities; balloons can burn in the air as well as ships in the water. But I maintain that one can, without taking leave of one's senses, raise a balloon with petroleum.

Why in this case not attempt this very simple matter of making a screw revolve in the air by the same motive power which

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succeeds so admirably with automobiles, and controlling a rudder analogous to that of a ship?

I wish that in the past I might have seen many builders of air-ships take part in aërial contests. Progress is only achieved at this price: it should be the work of all.

To my knowledge, there are in existence a dozen petroleum balloons, completed months ago, some of them belonging to millionaires, to whom the expense of aërial experiments would be a trifle. I have done all that I could to induce them to compete in the *Grand Prix de Paris;* for nothing is more annoying to me than to be alone in the air during a competition. I hope to have an opportunity of meeting them at the competitions at London or St. Louis and elsewhere. For it is probable that the multiplication of contests will attract a number of competitors, and it is for this reason that I beg for the organization of aërial contests in America, as well as in Europe.

Nothing is easier than to take part in the next experiments; for, in the present conditions of aëronautic industry, scarcely a month's time is needed for the construction of an air-ship. For my own part, at the beginning of this month of May I have in process of construction three new air-ships which will be finished before the first of June. These will be "No. 8," "No. 9," and "No. 10" of the series. In their general construction they resemble "No. 6," which won the *Grand Prix de Paris* in 1901, which made five voyages in the Mediterranean in January and February, 1902, and which I shall ride again at London in June. But they differ from it in their dimensions, in the perfecting of details, which I wish to study in succession.

I am doing this for the sake of example; and if, contrary to my hope, I do not encounter those who wish to compete with me, on either side of the Atlantic, there is left to me, at least, the resource of exhibiting my air-ships in the leading cities of the world, with the object of popularizing, by every means in my power, the idea of aërial navigation.

The essential thing is to create a universal movement in favor of aëronautics.

Until lately, I have thought that to attain this end it was enough to ascend into the air myself, and to multiply my experiments, at the risk of my life. But now I see that this is not enough, and that, before the aërial idea becomes practical, it

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will be necessary to popularize it by means of the pen. For this reason I am writing this first article.

For a long time, I have been solicited to express my opinions on the state of the aëronautic question, and until now I have refused, thinking that action was more serviceable than writing. But some recent interviews have shown me that there is much prejudice to be destroyed and much scepticism to combat, the existence of which concerns the future of aërial navigation and its practical utility, which is denied by some men who have never mounted the car of a spherical balloon, and who, in consequence, are no more competent for the discussion of the question than I should be for the interpretation of Babylonian hieroglyphics.

I believe it to be the duty of those who have made a study of aëronautics to destroy the errors implanted in the minds of the public by those who are ignorant of the first word of this branch of science. It is for this reason, I repeat, that I have decided to publish this first article.

And if a single article is not enough, I shall write a series of as many articles as the balloons I construct or the ascensions I make, for I perceive in closing this one that it is shorter and more convenient to pen a system of aërial navigation on paper than to set it in motion and make it perform its functions.

And, if it is impossible to set forth the vast and multiple problems of aëronautics within the narrow limits of magazine articles, I am resolved to publish in different languages the voluminous manuscript in which, for four years, I have summed up, for my own instruction, in the form of a treatise, the scientific principles and the historic facts of aërial navigation, from the more remote times until the present day.

This book will be, I hope, a revelation to readers so often deceived by authors who are ignorant of even the elements of the aërial question. In it I shall explain why and how I became an aëronaut, and I shall not be content till every person is an aëronaut, either in air-ships or in aëroplanes, but in the open air and not "*en chambre.*"

A. SANTOS DUMONT.

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THE NATURE OF VOLCANOES.

BY N. S. SHALER, PROFESSOR OF GEOLOGY IN HARVARD UNIVERSITY.

THE history of our understanding as to the conditions of volcanic action shows in a very clear way the steps by which a science is established. Among primitive folk, even when they have attained a considerable literary culture, the accidents of the earth, however striking, are taken as a commonplace manifestation of unseen powers—doings which need not be accounted for, or which may be explained by the will of gods or demons. Thus, in the Bible there is scarcely a trace of scientific curiosity, and none whatever of any enquiring motive such as has led to the rational interpretation of the natural realm. Vast and far-reaching as was the Hebraic spirit, it remained singularly unmoved by the events of the material world, looking upon them all as incidental and essentially unimportant, save as expressions of a Divine will.

The first clear trace of any questioning as to the nature of volcanoes, is found among the Greek philosophers. Between the seventh century, B.C., and the Christian era it is evident that enquirers were concerned with this matter, as they were with most evident problems of the earth. They attained to no success, in part because, though keen enough in guessing possible explanations of events, they never learned to criticise their conjectures, or, in the language of modern science, to verify their hypotheses. They were content with any idea which seemed to account for the facts. In larger part, their failure was due to lack of knowledge as to the nature of heat. By them heat was reckoned as an element, along with earth and water, among the primitive things that went to make up the world; so that when a volcanic explosion occurred it was to be explained as an outpouring of heat, much as a spring is of water.

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Although our modern science is the child of Greek learning, it was a child of very slow growth. For more than a thousand years, the people of our Aryan race in Europe, though inclined to the study of phenomena, were so profoundly imbued with the Hebraic motive, and so much under the control of the Roman spirit, which was also completely separated from scientific interests, that no interpretation of Nature was essayed. It was not until the intellectual revolt called the Revival of Learning, in the fifteenth century, that the people of Western Europe began to question the world as to the laws of events, or to see in it more than good from the Creator's hand or evil from the interference of the devil and his imps. The scant knowledge of Nature which served as the foundations of modern science came almost altogether from the Greeks, and as mere fragments of the ancient learning. It provided little in the way of accurate information, and served not at all as a guide in methods of enquiry. The seeking spirit was happily native in our race and sprang swiftly into activity. The research work done by Leonardo da Vinci, fitly renowned as a painter and sculptor, but even more distinguished as an investigator, though unguided by earlier masters in its critical quality, foretold the best of our modern science.

From the Renaissance to near the end of the eighteenth century we find the nature of volcanic action the subject of much unavailing enquiry. The students of the problem were kept far from the truth, by the ancient notion that fire was a distinct element, one which was escaping from the depths. They came no nearer the truth than to suppose that some deep-lying burning material, such as coal, melted the rocks, and thus gave rise to the lava and gases which are poured forth in eruptions. Pictures in geological treatises of two hundred years ago show such fires in vast chambers, of which the roofs are the crust of the earth, through which the flames have forced a way to the surface by a crater. It was only when the part which oxygen plays in combustion was clearly recognized that it was seen that no ordinary process of burning could account for the evident facts, and that the study of volcanic action must proceed on other lines.

The first certain clue as to the cause of volcanoes was found when the outlines of the history of celestial spheres came to be discerned by astronomers—when it was seen that each of these bodies, suns, planets, and satellites alike, is in an early stage

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of their development, intensely fluid, from heat, and that, parting with a share of their heat which goes forth into space, they in time come to be cold upon their surfaces though they may remain for ages intensely hot within. Applying this knowledge as to the general history of the spheres to the earth, geologists proceeded to explain volcanic eruptions by the supposition that they were due to the escape to the surface of some part of the ancient store of heated matter which lies below the frozen outer crust. This view, which was suggested in the later part of the eighteenth century, is evidently the basis on which a valid explanation of the complicated problems of volcanology must be founded.

Following the path of enquiry opened by the earth's ancient history given to them by the astronomers, students of geology began to seek the causes which lead to the violent ejections of heated materials from the depths of the earth. Curiously enough, it was only within the last century that observers came to recognize one of the most conspicuous features in all volcanic explosions, viz., the vast quantities of steam which always escape during such outbreaks. It had long been noticed that torrential rains usually attend on these explosions; but this was accounted for on the supposition that the water had gathered in caverns at the roots of the crater, and had been driven high into the air at the moment when the eruption began. Moreover, this stream, being commonly mingled with finely powdered rock, appears in the ejections of the cave as very dark-colored, often nearly black, a quite different hue from the unstained vapor of water. A close study of the matter showed that all lava, as it comes forth from the depths of the earth, is charged with steam. If we watch it near its exit, we see that the surface of the fluid boils furiously from the escaping vapor. Even after flowing for hours, every square inch of the surface shows from moment to moment the escaping bubbles. Next the very hot surface, the steam, being intensely heated, is perfectly transparent; as it rises and cools, it becomes more and more visible; and, at a considerable height, it forms the cloud-like wrap of vapor which hangs over the path of the flowing lava.

Further enquiry has clearly shown that the force which brings about a volcanic eruption is mainly, if not altogether, due to the expansive power of steam at the temperature, it may be, of 2,000° or more, Fahrenheit, and that, in large measure, the physical

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condition of the ejected rocky matter, whether ashes, bombs, or flowing lava, depends upon the amount of this steam in the fluid rock and the temperature it attains. This can be most clearly illustrated, perhaps, by certain observations which I had an opportunity to make during a slight eruption of Vesuvius in 1882. At that time, the active cone was small, and the explosions were so limited in energy and so regular that, with a little care, it seemed possible to obtain a very near view of the process. Taking advantage of a strong northwest wind, which inclined the materials thrown out of the crater to one side of the cone, I approached the steep from the windward, unbombarded side.

On my way toward the active cone, I passed the well-known observatory, where there are instruments for measuring the earthquake shocks which such explosions send through the mountain. It did not need the insistent bobbing of the seismometers to indicate these quakings; they were evident enough to the senses miles away from the vent. I was told by the officers of the establishment that the energy of the movements had been for some time increasing, and that the cone would most likely be blown away in the course of a few hours. As there was no evident basis for this conclusion, I was not deterred by it. It was, in fact, years afterward before the change occurred; for then, as now, the conduct of a volcano eludes prediction. In company with my stout porter, who earned his wage by keeping his agreement to beat off his fellows who swarmed about, I gained the edge of the crater, with no other inconvenience than that which came from the violent shaking of the cone in the successive explosions, and from the strong gale which carried the ejected fragments of lava towards Pompeii. Once on the margin of the crater, with my face protected by a paper mask, it was possible for me to look down into the pit and to see, perhaps nearer to the seat of an eruption than any other geologist has had a chance to do. The conditions were not favorable for careful observation. The heat was almost unendurable, and the air at times so charged with steam and sulphurous fumes as to be suffocating. Moreover, at most of the successive explosions I was thrown backwards down the ash-covered slope, before I had a chance to note just what happened; yet the effort was not altogether fruitless, for I beheld certain features which threw light on the processes of an eruption. These features I will now describe.

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The pit of the crater was several hundred feet in diameter and one or two hundred feet deep: there being nothing in view that would serve as a scale for measurement, its size could not be well determined. The inner slopes of the cavity led down, in the manner of a funnel, to a well-like shaft, about sixty feet in diameter, which descended nearly vertically. The upper part of the funnel was not hot enough to glow, but about the lower third it was of a dull red heat, and thence downward of a brighter hue, until, in the vertical shaft, it glowed like the eye of a furnace. About four or five times a minute, this shaft, usually empty, was partly filled with white, very fluid, hot lava, apparently as fluid as water, which rushed swiftly upward until it occupied the lower part of the crater to the depth of forty feet or more. Then the whirling pool swelled like a huge bubble which burst open, so that the broken masses of lava were driven upwards as if shot from the mouth of a cannon. The action was very swift, so that from the time the lava came in sight in the shaft, perhaps fifty feet below the base of the funnel, to the instant of the explosion was not more than three seconds. As soon as the discharge occurred, the lava not blown out fell back out of sight into the depths of the shaft.

Although, as before remarked, it was not possible narrowly to observe just what occurred at the moment of the successive explosions, for the reason that the shocks generally threw me away from the edge, some of them being less intense than others I managed to get a sufficiently clear view of the process. It was evident that the explosion was due to the escape of gas or vapor at a very high tension. At the moment of explosion, the cavity below the rent surface was apparent. The impelling vapor was at first perfectly transparent; in a moment, however, it took on a steel-gray hue, and in a second or two had the whitish color of steam. As the cloud swept about me, it was perfectly evident that it was the vapor of water with some sulphurous gas, and probably some chlorine and other gases. In four or five seconds, the strong air currents due to the heat and the gale of wind drove the steam out of the pit, so that all parts of it were clearly visible. I reckoned the speed of ascent of the fragments that were cast upward as at least four hundred feet a second. The time that elapsed between the bursting of the bubble and the crash of the falling masses on the further side of the cone, indi-

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cated that they rose to the height of more than fifteen hundred feet above the point of discharge. My observations at the crater were suddenly interrupted by a lull in the gale which had made them possible. Masses of the lava, some of them as large as nail kegs, began to fall near me so that I had to retreat, and that speedily. My valiant porter objected to my haste, saying that there was no grave danger, for the chunks of lava were *soft!*

All that was visible in the crater whence this slight but instructive eruption came bore out the supposition that the motive power of volcanic outbursts is steam. Much else that could be seen was to the same effect. Thus, as the fragments of lava, whirled up at each explosion, swept through the air, their surfaces cooled, so that when they came back to the ground they had a darkened crust. As they burst open at the moment of contact with the earth, they visibly ejected steam. A small stream of lava flowing from the cone poured forth steam from every part of its surface. As the fragments sent up by the explosion rose in the air, they were enveloped in a cloud of steam, which, as it drifted away, yielded a little rain.

After I left the cone, the explosions—at first, as above noted, not more frequent than four or five per minute—came at shorter intervals, until, for a time, the discharge seemed as continuous as that from a locomotive moving at high speed,—where we know that, for all the seeming continuity of the action, the outrush of vapor takes place by successive jets, the intervals being too brief for ear or eye to note them. This, like much other evidence, goes to show that the eruptions of a volcano are essentially like boiler explosions, where steam at high temperatures rends the walls which restrain it. The tumult of the greater outbreaks arises from innumerable rupturings such as occurred at distinct intervals in the very small instance above described. It is furthermore evident that the water which impels the ejection is in most, if not all, instances very intimately mingled with the rock which, when melted, forms the lava. When the eruption is so violent that the lava is brought suddenly from the depths of the earth, as is the case in all considerable outbreaks, the lava is blown into a dust finer than can be produced by any process of grinding rock. Thus, in the explosion of Krakatoa in 1883, the dust was in such minute particles that much of it floated for three years, all the earth about, before it came to rest; and some

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part of it appears to have gathered into what were called "shining clouds," which gradually rose higher and higher until they seemed to escape from our atmosphere. Such dust has been known to bring midnight darkness at mid-day more than a thousand miles from the volcano that poured it forth. This measure of comminution from exploding steam indicates that the water was very completely mingled with the rocky matter before it was heated.

Where the ascent of the lava to the surface is more gradual than it is when the material is rent into dust, the water appears to gather into aggregates, so that the explosion produces larger fragments looking like grains of sand or having a pebbly form and size. As the violence of the movement is still further reduced, the steam has a chance to boil out of the lava, which then accumulates in the crater, or in the pipes below its level, until it breaks its way through the heap of cinders of which the cone is composed, and flows away as a stream. When, as in the great volcanoes which remain permanently in eruption, the boiling lava remains long in the cup, it may part with nearly all its steam; but in all cases it is evident that this vapor is the mainspring of volcanic action.

Taking it as proved that volcanic explosions are essentially due to the expansive force of steam at a very high temperature, the next question which geologists have to face concerns the method by which the water obtains access to the rocks, and becomes intimately mingled with the materials of which they are composed. On this point there is as yet no agreement; some students of the matter hold that the water in question passes downward from the surface to the heated depths, and there coming in contact with the molten rock is converted into steam. This view is clearly untenable, for the reason that, as we have seen, the water is perfectly mingled with the lava; a condition which could not be brought about by a mere contact with heated rock on its way to become lava. The least generation of steam under these conditions would tend to expel the descending water through the passages by which it entered the earth. It is true that surface water accumulating in the fissures beneath a long silent cone may be suddenly vaporized by an ascent of lava when the activity of the volcano is resumed. Many eruptions begin by the ejection of large quantities of water, which may be thus accounted for.

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But this in no wise helps us to explain the mingling of water with the molten rock, which is the key to the problem of its ejections, and is, as we shall see, the clue to many other important questions in volcanology.

To determine the steps by which the water of lavas finds its way into the fluid rock, we need to set about the task in the manner of the modern naturalist, as Leonardo did his work and thereby showed how such work should be done. We should note, in the first place, how volcanoes are distributed over the earth. This distribution is evidently peculiar; as is shown by the fact that, until our acquisition of Alaska, there was not a single cone in the United States which had been distinctly active in recorded time. The records clearly show that of the many hundreds, if not thousands, of volcanic cones which have been seen to discharge, all are in the sea or near thereto, not one of them being as much as three hundred miles inland. Furthermore, the geological history of the multitude of now extinct volcanoes in the heart of the continents, shows that, in general, the cessation of their activity was coincident with the disappearance of broad waters from their neighborhood. It is, in a word, evident that there is some casual relation between what takes place beneath the seas and the existence of volcanic activity.

The fact that active volcanoes are limited to the ocean floors and to the parts of the great lands lying near thereto, has been taken by some enquirers to be evidence that it is to the downward penetration of water that we are to attribute, in the manner above noted, the presence of the fluid in lavas. The fact is, however, that water must enter the under-earth more readily on the land than beneath the sea-floor; for on the land area we have an extensive river surface, especially in mountainous districts, while on ocean bottoms there is practically everywhere an essentially impervious sheet of recent and unbroken deposits through which water cannot pass. The true basis of the relation is to be found in quite another series of actions, which may be briefly set forth as follows:

Let us first note that, from the depths of the earth, heat in large quantities is constantly and everywhere passing forth into the cold spaces that wrap in the sphere. Each year, enough heat thus creeps upward through the blanket of rocks, if it could be held in the crust, to raise the temperature of a layer of any

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ordinary stone a foot in thickness by some degrees of temperature. Now, beneath the sea-floor, strata are normally accumulating at a geologically rapid rate; and every layer, because it is a non-conductor, serves to retain this heat, as does the mineral wool covering in a boiler or the "cosset" on a tea-pot. The result is, that a layer of rock laid down many geological periods ago on the cool surface of the ancient ocean floor, say at 40° Fahrenheit, if covered by successive strata to the depth of 100,000 feet, will acquire a very high temperature, probably somewhere near 2,000°, Fahrenheit. We see by the remnants of strata which are exhibited on the land that even much greater thicknesses of deposits may be heaped up over wide areas. Now, let us remember that, as beds of any kind are laid down in water, they are always made up of fragments; and between these bits are spaces which are filled by the fluid; and, furthermore, that the bits themselves are water-soaked. This water, as I have found by extended enquiry, amounts in different kinds of strapped rocks to from one-twentieth to one-fifth of their mass. Given this water, and the heat which must come to it with deep burial, and we have the fundamental conditions of a volcanic explosion—conditions which do not exist beneath the lands where the blanket of strata is always wearing away (with the result that the temperature of the underlying rocks is ever lowering), and which exist only beneath the great water areas, where strata are accumulating and, as a consequence, the deep-buried water is ever becoming hotter and ever straining more vigorously on the rocks that case it in.

As for the ways in which volcanic vents are opened, and the details of the process by which the imprisoned water finds its way to the surface, driving with it the melted rock in which it is contained, our knowledge is yet limited. It is clear, however, that many if not most volcanoes are situated along those lines of fracture of the earth's crust termed "faults,"—breaks which may extend from the surface downward for many miles of depth. These fractures often are so placed that they traverse coast lines, so that the volcanic materials produced beneath the sea floors may find their way to the air on neighboring continents. This arrangement of volcanoes along great breaks in the strata, accounts also for the fact that, when a volcano on one part of the rift becomes active, others on the same line are likely to erupt, as has been the case in the vents on Martinique and St. Vincent.

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It is from many such instances evident that the movements of the heated rocks which feed one crater—movements of much violence—are likely, by the resulting shocks, to awaken a train of convulsions which may propagate the action far from its original source.

It is to be borne in mind that, when extremely heated rocks containing water are penetrated by a fault, the expanding steam will force the whole mass in movement towards the place of escape—as in the instance of dough, where the yeast fermentation produces gas, the material creeps in the direction of least resistance. When the rocks start on their enforced journey they are probably solid, kept in that state by the vast pressure of the beds above them, but as they arrive near the surface, they become softened and finally, it may be, as liquid as molten glass. The evidence goes to show that the lavas and ashes which are poured from the greater volcanoes are often derived from locations hundreds of miles away from the vent by which they escape. Thus, while the materials thrown out by Aetna have probably amounted to a bulk of more than a thousand cubic miles, the foundations of the cone have gradually risen since ejections began, until now its base is some hundred feet higher than at the beginning. This clearly indicates the remote derivation of the erupted matter.

The foregoing account of the steps by which our knowledge of volcanic action has been won is but a sketch. It takes no account of sundry hypotheses and conjectures, which have had their place in the procession of ideas, but have not helped the progress of geology. It neglects the problem of the moon's so-called volcanoes, for the reason that those remarkable structures, though vents of ejection, are clearly not really comparable to those now existing on the earth. Even this inadequate story shows how, step by step, by the interaction of the several physical sciences, the enquiries of geologists have slowly won a share of truth—truth as yet incomplete in this as in other fields, but sufficient to make the earth rational to our understanding.

Turning now to the recent calamitous eruptions of Martinique and St. Vincent, let us see what light our knowledge of volcanic action turns upon these events. It is, in the first place, evident that these eruptions, frightful as they have been in their effect on human interests, are of relatively slight physical importance. The intensity of a volcanic outbreak may be approximately

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measured by the distance at which the sounds produced are heard. In the greater eruptions, such as that of Krakatoa, the most violent explosions were audible two thousand miles or more away from their source. In the Martinique eruption, they appear to have been heard at a distance of no more than two hundred miles. As the energy of the shock to air and earth is roughly proportional to the areas affected, it appears that the former disturbance was at least a hundred times as violent as the latter. The measure of energy expended in the outbreak of Mt. Pelée and the amount of the materials thrown out, or the distance to which they were hurled, do not, from the information now at hand, appear to have been anything like as great as in the case of many Vesuvian eruptions, and are not to be compared to the cataclysms of the Javanese archipelago and those of Iceland, or even with the explosions of Aetna. To what, then, may we attribute the unexampled magnitude of this calamity; for in no other well-attested eruption has the loss of life been so great?

A glance at the position of St. Pierre in relation to the volcano which destroyed it shows that the city lay within four or five miles of the cone, and on the side whereto the prevailing winds would be likely to drive the vapor and ashes from the crater. The ash ejected appears to have been mainly of a coarse nature, and the quantity of volcanic bombs—that is, masses of lava, which, whirling, take on a rudely spherical form—more than usually great in quantity. The falling ash apparently served to force the heated air and steam down upon the surface, so that it flowed over the town, while the bombs, molten lava within, though hard crusted without, were as effective as hot shot in carrying heat and setting fire. It is probable that, in this as in other eruptions from long-dormant volcanoes, much carbonic-acid gas, which had gathered in the caverns at the base of the cone, was mingled with the steam and sulphurous fumes, the whole forming an irrespirable air which quickly and mercifully suffocated the stricken folk. In some instances, this tide of mephitic vapors has been known to destroy all life for a radius of many miles about the point of discharge. Thus, while the accident appears to have been in a geological sense relatively unimportant, the position of the town in relation to the cone, the neighborhood of sea which barred flight, and the somewhat unusual swiftness in the development of the outbreak, combined to make it a very great calamity.

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There are certain lessons to be drawn from the disasters of Martinique and St. Vincent. The first of these is that the neighborhood of a volcano that has been so recently in eruption as to retain its shape in a well-preserved state, is not a fit place for a city or other important seat of man's endeavors. The second concerns the importance of systematic and extended observations of volcanoes, with a view to an effective foretelling of approaching eruptions. So far, observations of this nature have been limited and imperfect. There is reason to believe that it will neither be difficult nor costly to obtain data such as would have spared the thousands who died in the recent disasters. It is clearly not in the power of man to prevent the activity of volcanoes, as he well may the vastly more destructive plagues of war and disease; but he may by his understanding lessen the evils they inflict, as he does those of the hurricane or the earthquake. It is well to note, however, that the calamities which may thus be avoided, though in their nature appalling, constitute but an insignificant part of the sum of death and destruction that comes to man. Though this earth beneath our feet is the seat of titanic forces, it deals gently with its living tenants—far more gently than they with one another. That life is here as the result of at least a hundred million years of uninterrupted progress, shows that the interference of the powers of the under-earth with the course of life has not been serious.

N. S. SHALER.

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THE NEW INFLUENCE ON THE BRITISH THRONE.

BY LADY JEUNE.

PROVIDENCE, which often seems capricious in guiding the fate of nations, decreed, at three important epochs in English history, that the reigning Sovereign should be a Queen, and not a King. The reigns of Elizabeth and Anne were times of momentous issues, and the reign of Victoria was one great social revolution from beginning to end.

It would be very difficult to compare the rule of any of these three Queens with those of the other two, and yet, in some respects, they were all similar. Elizabeth ruled a country just emerging from the throes of the Reformation, while she had to reckon with a powerful party at home, which was alien in religion, aided by the greatest Catholic power of the world, and animated by fervent devotion to the loveliest and most unfortunate of rivals, who was the mother of a son, while she herself was unmarried and without an heir. A woman of strong will and passions, imperious and brave, she chose her advisers well, and, with the growing Protestant feeling of the country to support her, she destroyed the power of Spain. Her time was one of great statesmen, philosophers, soldiers, sailors, explorers, and men of letters, and she gave her name to an era which is one of the most glorious in English history. The reign of Queen Anne was again a period of external development; but she, like Elizabeth, found her strength in the Protestant feeling of Europe, and in the genius of the greatest soldier of the day. She also was childless, but, though the Roman Catholic party were open and avowed sympathizers with the Stuarts, the question of the succession was no longer in doubt. The reign of Anne, also, was rich in distinguished men—soldiers, sailors, poets, historians. Though Anne

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was inferior in every way to her great predecessor, she was a woman of unblemished character, and she was a fitting Queen for her time; and the halo which surrounds her reign is in many ways no less brilliant than that which was imparted to her epoch by Queen Elizabeth. Queen Elizabeth and Queen Anne, however, both reigned at times when rulers of inferior abilities could not have occupied the throne of England. The great wars of both reigns were waged to uphold the supremacy of the Catholic power in Europe, and to crush the young Protestant feeling of the day. England, the champion of the new faith, was sorely pressed in the time of Elizabeth by Philip of Spain, and by Louis XIV. in the later reign. To England the struggle was of vital importance, as defeat meant her complete annihilation: any hesitation, any faltering, any mistake on her part would have altered the fate of the world. But the struggle was won, and it was won in great measure because the government of the English nation was in the hands of women, under the guidance of statesmen and soldiers of the highest ability.

The accession of Queen Victoria saw England again at the beginning of another period of trial and danger, but, this time, of an internal and social nature. The country was suffering from the effects of the costly Napoleonic wars; there was great distress and poverty. The dynasty to which she belonged was unpopular, not only because of the stupidity and immorality of its representatives, but because it presented no sentiment, no ideal, to a people chivalrous and romantic in many respects. The social and political changes of the last sixty years were just beginning. The discovery of steam power, and its adaptation to the service of modern life; the awaking of the interest of the working classes in the questions which so closely affected their welfare; and the passing of the Reform Bill, which entirely changed the centre of political power, were all creating a feeling of unrest and discontent. The aristocratic governing class had just been divested of political power, and that power had been handed over to the democracy, who were ignorant and impatient at the conditions under which they lived, and eager to show their strength. The effect of Free Trade was just giving birth to great industrial changes, the Manchester school had sprung into existence, and with all the zeal of those who, for the first time, possess power, the working classes were making their voice heard in the

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councils of the nation. The poverty in many parts of the country, the wretched plight of the workers in factories and in all industrial enterprises, had aroused a sentiment of revolt; while the Chartist riots showed how keenly a large number of the citizens were resolved that there should be gigantic improvements in every condition of life.

The situation was full of grave menace to the future of England, and it required the wisdom of ministers, the forbearance of the aristocracy and the patience of the working classes to deal successfully with the problems to which it gave rise. Above all, it was necessary, at such a juncture, that the occupant of the throne should scrupulously observe the limitations which the constitution had set to the powers and privileges of the Crown. The very seriousness of the situation, perhaps, made that moment appropriate, in a unique sense, for the accession of a queen; and the presence of a girl on the throne, surrounded by wise and experienced advisers, may well have afforded the best security conceivable for the peaceful solution of the national problem. At any rate, as one reviews the events of Victoria's reign, with its marvellous developments, its complete social revolution, its increase of colonial and imperial power, its domestic peace, its growth of wealth and prosperity, its spread of education, together with the improvement in the condition of life of every class, and the profound popular devotion to the Queen, one asks whether, or in what measure, the Victorian age was the great epoch it undoubtedly proved to be because the ruler of England was a woman.

The questions which the country had to decide during the early years of Queen Victoria's reign concerned themselves with subjects which appealed to the heart of a woman—the deplorable situation of the laboring classes, the disgraceful position of women and children working in factories and mines, the much neglected state of education, the depression in trade and the intolerable conditions of life from which thousands of the people were groaning for deliverance. These were fitted to arouse the womanly interest and sympathy of the Queen, so that she could naturally and easily associate herself with nearly all the reforms required, even if she were not able to put herself at the head of the movement. The sight of the Queen, her excessive youth, her generous, responsive answer to all that was asked of her, awoke

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the sentimental and romantic feeling that a woman under such circumstances must always call forth. It was accorded to her by an affectionate and warm-hearted people. Her youth and isolation appealed to every one, while her early marriage and happy married life, and her devotion to her husband, completed an ideal picture of home, graced by the qualities which a people like the English understand and appreciate. This feeling was, it is true, from time to time, rudely shaken, and there were occasions, even during the early part of the reign, when the Queen, as representing Royalty, was unpopular. There were times when she drove in London and not a hat was raised nor a cheer given, and when her path was full of difficulties, which it needed the wisest and calmest judgment to surmount. There are many still alive who remember the long silent drives which she took through London, and contrast them with the passionate and fervent enthusiasm which her later appearances always evoked, when thousands and thousands of her subjects waited for many hours to catch a glimpse of their Queen as she paid one of her rare visits to the metropolis. That she found the sagest of counsellors in her husband there can be no doubt, and, misjudged and unpopular as the Prince Consort once was, he lived to be appreciated by a people who learned too late, alas! what a debt they owed him.

The great principle of government impressed on the Queen by Lord Melbourne, her first Prime Minister, was the importance of her being a thoroughly constitutional sovereign, and so deeply did she take his teaching to heart, that during her reign she placed the Monarchy, as an institution, on a position of permanent strength.

We are now on the threshold of a new reign, and of an altogether different sentiment. King Edward has succeeded after a long apprenticeship, which he has served conscientiously and well; and he comes to the throne of his ancestors with the enthusiastic affection of his people. It is not from a personal point of view that we discuss the new position, or judge it in contrast with the reign just ended. It is a question of much interest, and one not easy to decide, whether a country prospers best under a male or a female sovereign; for though in England, where a monarch must needs be constitutional, the powers of a male and

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female monarch are exactly alike, there are circumstances which may render the character of the reign of the one essentially different from the rule of the other. The power of the early kings of England lay in their military position, and their absolute authority. If we think of the kings of England before Henry VIII., it is as soldiers only, wielding the power which in those stormy times appertained to the king. The revolutions through which England passed in order to establish her right to govern herself, deprived the kings of their military power and curtailed their rights. Since the early Plantagenets, no King of England has appeared on the stage of history as a great soldier, such as was Frederick the Great and other royal heroes. The tendency of constitutional government has been steadily to diminish the personal power of the King, so that he has become merely the exponent of the views of his people, as expressed through Parliament.

The English people have not much reason to be proud of their later kings. The members of the Hanoverian house were meddling, stupid, narrow-minded Germans; and when they did interfere in questions of importance, their action was always disastrous. The separation of America from Great Britain was the result of the obstinacy of George III., and the gradual strengthening of Parliament was the logical outcome of a succession of incompetent rulers. Had the transition period of modern English history, from the passing of the Reform Bill until to-day, come during the reign of another George III., it would not have been the bloodless revolution it was. A man with any character, any spirit, any belief in the rights of kings, must have been forced into opposition to the new ideas, the ultimate effect of which was to put almost unlimited power into the hands of a then ignorant democracy; and he would have had support and encouragement from the aristocratic classes of both political parties, who equally hated and dreaded the changes. All the political events of the century have diminished the power of the Crown, and have broken down the tradition of the personal importance of the Sovereign, so that the position of a man on the throne during this period would have been one of exceeding difficulty and danger. It was a most fortunate accident that gave England a young and adaptive girl as ruler at that moment, and allowed her long and marvellous reign to bridge over the period

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during which the old customs were passing away, and the new order of things adapting itself to the new conditions under which the Kingdom was to exist—which, while destroying the personal autocracy of the Monarchy, has in reality had the effect of strengthening the Monarchy to an extent difficult to describe.

The nineteenth century was a humanitarian age, and its quality as such could be best fostered and developed during the reign of a queen. If Queen Victoria had no other claim to the gratitude of the Empire than that she endeavored to carry out the highest ideals for the welfare of her people and the general amelioration of their social and political condition, we should yet owe her much. We have, however, perhaps, overdone our humanitarianism a little, and are passing in a measure through an emotional and somewhat hysterical stage. The self-control which has been one of the most cherished of English characteristics, has disappeared to some extent, and we stand in need of a sterner and more bracing influence, which the new rule may perhaps inaugurate. A king can be stern and strong: a queen cannot. It is possible to speak plainly, to discuss matters, nay, even to argue, with a man; with a woman we all know the result. No woman is logical; and, however unemotional and masculine, she will act from impulse and not reason. A woman's impulse is to be gentle, sweet, gracious; and the whole course of her life and her impulses moves in that direction, while the age in which she lives becomes impregnated by the same spirit. Therefore, it follows, especially where we have a strong personality, as in the case of Queen Victoria, that, though the standard does not fall or even become relaxed, questions are regarded from a less robust point of view. The very womanliness of the Queen, which gave her the power she possessed and the affection she won, caused all her influence to be thrown on the side of leniency; and the isolation in which she lived (the outcome of the great sorrow of her life) prevented her from judging of the true proportion of things, and added to the sentiment with which her people regarded her, so that the womanliness of the Queen had the effect of diminishing the hardihood of the national character, and of encouraging a spirit of "gush," which, though the last quality with which she would have had sympathy, has unconsciously become a strongly marked characteristic of to-day. The tenderness of the Queen and her sympathy with those in sorrow—as always shown, on the

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occasion of any public calamity, by her messages to the widows of colliers, sailors, soldiers, or any class of the community on whom some terrible disaster had fallen—and her hatred of capital punishment, were strongly marked features of her character: and though with many of the fads and fashions of her time she had no sympathy, it was difficult for her, as a woman, though a Queen, to proclaim publicly that she disapproved of them. There must have been occasions when the Queen would have perhaps astonished the country, could it have been realized how she regarded many of the questions and developments of her time, but her kindliness, and her desire not to wound, kept her silent. A man would probably be less tolerant; at any rate, no one would expect such reserve or consideration from him. A woman shrinks from any action which might have the effect of crushing a movement which, while she did not sympathize with it, she yet believed to be a genuine attempt to do good, and which might possibly be of some efficacy in that direction. A woman understands the enthusiasm and can throw herself into the position of those who preach crusades against the abuses they see around them, feeling that the woes and sufferings of life are beyond endurance. In fact, there is no humanitarian movement, wise or foolish, which the heart of a good woman does not go out to, and the sixty years of Queen Victoria's reign proved how thoroughly in that respect she was like her sex.

There is a great opportunity now for stimulating and bracing the national life and character. There is no need for sternness or hardness, but a true perception of the proportion and importance of events will produce a manlier sentiment. We are all inclined to judge conduct leniently, to make allowances, to justify actions in private life, just as, until the war in South Africa forced us into an opposite course, we have shrunk from taking up an aggressive position in public matters. It is not good for a country or a people to shirk the responsibilities which from time to time confront them, and which ought to be faced. It was no secret that the Queen, like many women, dreaded war; her feelings, her influence, were always on the side of peace. When war had to be undertaken, however, no one met it more courageously than she; and, though the smoke of battle was the cloud on the last months of her life, she never wavered in her belief in the righteousness of the cause we are upholding in South Africa.

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For many years of her reign, the Queen's advisers were "Peace at any price" men, and, constitutional as she ever was, she followed their advice—often, however, warning and protesting against the policy. In the position of monarch, a man could be less easily advised or persuaded to adopt such a policy; it would be more difficult for his advisers to convince him that he must acquiesce. In all the questions of life and of government he would take a broader view than a woman, and he could do so with perfect security, knowing that the country would expect him to be less yielding. In fact, the composition of a man's character, as well as his bearing and education, must necessarily create a totally different atmosphere of life and attitude of mind with regard to affairs, and the country would be prepared to see, and willing to recognize, any indication that it was under the sway of a strong personal influence, such as that of a sensible man of the world, who lived in touch with his people.

The late Queen's power lay, in a great measure, in the strong moral hold she exercised over the country; she came to the throne at a moment when an example of high conduct was needed; her whole life and reign was one of absolute and blameless purity, and the power of a woman in these days must always be embodied in that fact. She raised the moral tone of life, gave higher aspirations and a higher standard of conduct to the world. To her people she was the unselfish devoted Queen, the good wife and mother—in fact, the representative of the virtue we admire and prize. The great women of the world have not set the same example to their people—Catherine of Russia and Queen Elizabeth were great Queens, but in another sense. Purity of life, tenderness of heart, were not their rôle: they governed by right of birth, and they governed almost with the strength, the power and the passions, of a man. They suited the times in which they lived, when the world was not ready for the influences we look for to-day. They were cruel, hard, rapacious, sensual; but they had courage, ability and the instinct of government, as well as real personal power, and the times over which they reigned required the rougher, coarser, methods of control. There are certain faults and weaknesses in a man which are ignored, and not judged too harshly—even to-day, when we demand a high code of conduct—which in a woman would be impossible, for in her case no standard is too high, and any descent from the highest would

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be fatal to her power. The purest life, the keenest consciousness of responsibility, and the noblest sense of duty made Queen Victoria's reign an epoch quite apart from any other in history; and, even when the cold eye of criticism scans her history, that stainless life, on which the fierce light which beats upon a throne found never a shadow, will shine on as a precious example. We owe much to her great constitutional sense, to her generous and unselfish nature, but we owe her the deepest gratitude of all for the pattern she set us of what the life of a good and pure woman could be, and for the effect of that example all over her Empire.

Regard for self-interest and the instinct of self-preservation are as deep in the life of an Empire as in that of an individual; and though those feelings have been strong elements in the birth of Imperial life in England and throughout her Colonies, the golden chain which held them all together in the tightest of bonds was the common love and respect for the "Great White Queen." If, as we said before, the sentiment of attachment to her, and the softening influence of a woman, gave a somewhat undue impetus to the spirit of humanitarianism, which many affirm has weakened our national character, one can hardly regret it when we look on the other side of the picture, and realize what the effect of any other influence might have been. It has not injured us permanently, and, standing now on the threshold of a century in which the most powerful influence is a masculine one, we may look for changes in endless directions which must be the result of the reign of a King. There is no doubt that there will be a more masculine atmosphere, a more hardy tone of thought and mind. The position of women, we believe, will be affected very distinctly by the substitution of a Queen Consort for a reigning Queen. The ruling monarch must give the tone to character, thought, occupation, amusements, and must, indeed, be the prominent figure; the tenderness, the softness, the humanitarianism, the latitude of the past will gradually disappear, and the influence of a new order will evolve characteristics of a more vigorous sort.

Those who deplore the disappearance of the harder and stronger characteristics of Englishmen may take heart again, and await with the keenest interest the development of the new spirit.

M. JEUNE.

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AMERICA AND FRANCE.

BY GASTON DESCHAMPS.

I.

On the 27th of March, 1777, a swift and beautiful vessel called "La Victoire," commanded by Captain Le Boursier, sailed southward from the harbor of Bordeaux. After stopping near Saint Sebastian, in the little port of Pasajes, "La Victoire" reached South Inlet, in South Carolina, on Friday, June 13th, 1777.

Among the passengers of "La Victoire" was a gentleman nineteen years old, Gilbert du Motier, Marquis de La Fayette. These are the words in which Benjamin Franklin and Silas Deane announced, to Congress, the approaching arrival of the young traveller:

"The Marquis de La Fayette, a young gentleman of distinguished family connections and large fortune, has started for America, accompanied by some officers of distinction, with the intention of serving in our army. He is greatly beloved, and the good wishes of every one follow him. We can only hope that he will meet with a reception calculated to make the country and his undertaking agreeable to him. We shall be fortunate if the respect and attention shown him are of use in our affairs here, in giving pleasure, not only to his powerful relations and to the court, but to the whole French nation. He leaves behind him a pretty young wife, and for her sake, especially, we hope that his bravery and his ardent desire to distinguish himself may be somewhat restrained by the wisdom of the general, to the extent, at least, of not allowing him to incur danger when the occasion does not exact it."

Nothing could be more kindly, more solicitous than this letter. America adopted as a son this young hero, who put at the service of liberty a virgin and resplendent sword.

Twenty months after this glorious landing, La Fayette returned to France for a season, upon a ship called "L'Alliance," and succeeded in persuading the French government to despatch

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the auxiliary force which, under the command of Count Rochambeau, reached America in the summer of 1780.

"La Victoire," "L'Alliance"! These two symbolic words haunted my imagination as the steamer "L'Aquitaine" was bearing me over the surges of the Atlantic, toward the hospitable shores of the United States. I had re-copied in my notebook this beautiful letter of La Fayette to the illustrious Washington:

"Farewell, my dear General; I hope that your French friend will always be dear to you. I trust that I shall see you again shortly that I may tell you in person with what emotion I leave, for the present, the country where you dwell, and with what affection, with what veneration, I shall always be your respectful and sincere friend."

While I sojourned in the immense territory of the Union, among the populous towns of Massachusetts and Connecticut, on the verdant heights of California, in the midst of the pasture lands of Texas or the plains of Arizona, under the perfumed magnolias of Louisiana, I thought of the tradition, already more than a hundred years old, which unites the French and the Americans.

This tradition must not be menaced; it must be defended against the machinations of those who have, apparently, an interest in setting it aside.

To maintain this treaty of alliance, concluded in the smoke of battle, it is enough that France and America should learn to know each other better.

II.

Despite all the books which French travellers have written about America, Americans are but little understood by Parisians. We think of them too much as resembling those noisy individuals who find a certain grotesque pleasure in throwing a shower of gold around the restaurants of the boulevards, and a shower of dust in the eyes of the loungers. The papers are full of the doings of some "high roller" or other, who, by his foolish extravagance, dazed the waiters in the Hotel Ritz, the Grand Hotel, or the Hotel Continental; and the derisive public regards, with a slightly distrustful irony, these florid accounts of wealth and the pranks of these millionaires.

"What?" the good Parisian *bourgeois*, accustomed to observe and to criticise, says to himself. "What? Is this the great people who, we are told, are so industrious, so grave, so earnest?" And

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little by little he is confirmed in the opinion, assuredly false, according to which Americans were created and put into the world for just two purposes—to make dollars and to spend them in folly. We may well say: "Undeceive yourself, good Parisian *bourgeois*. Do not trust only to the evidence of your own eyes and ears." The Parisian *bourgeois* replies: "I know what I see, and I remember what I hear," and the Parisian *bourgeois* is as obstinate as a mule. When he has once acquired an idea, nothing will make him give it up.

This mischievous prejudice is to be attributed, in great measure, to the Americans who come to Paris. They deliver themselves, bound hand and foot, to the hotel waiters and the cabmen who, naturally, in Paris as in all possible or imaginable capitals, show them only the most trivial things, such as the second-rate theatres and the café concerts.

There are, of course, notable exceptions; for instance, my good friend Mr. R—— of Philadelphia, who follows an intelligently prepared programme in his French travels, and who will retain ineffaceable recollections of them.

In Paris, instead of visiting the pot-houses of Montmartre or exploring the sewers, Mr. R—— goes to the Institute, to the College of France, to the Sorbonne. He sees our savants, our writers, the men of brains and of heart who are truly representative of our nation. I am sure that, returning to Philadelphia, Mr. R—— can give account of the virtues and the traits which commend to universal esteem a country where Victor Hugo has left brilliant disciples, where Pasteur survives in the brilliant group of the *Pasteuriens*, where Rostand makes the sonorous French alexandrine resound triumphantly, where philological science can count among its adepts a Gaston Paris and a Michel Bréal, where the science of Lavoisier and de Fourcroy has been added to by the discoveries of Berthelot.

These are the things to be seen in Paris, and not the capers of this or that buffoon, famous in the two worlds, yet of whose very names most intelligent Parisians are ignorant.

American literature, already so rich, is lacking in good and comprehensive books about France and the French. This is a department of literature which should be attractive to the youthful talent with which the universities in America are teeming. Each year a certain number of young Americans cross the

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Atlantic, perhaps to study at the College of France, perhaps to learn, in our national *École des Beaux-Arts,* the principles of the arts of design, notably of that charmingly pastoral architecture which directs the construction of the cottages in which the workers of the United States rest after the labors of the day. I wish that one of these young men might take up his pen with the object of offering to his compatriots an exact and complete picture of contemporary France.

If Americans were better informed as to French affairs, one would not be met, on first touching the soil of the New World, with the question, always the same:

"Do you often go to the *Moulin-Rouge?*"

The *Moulin-Rouge,* my dear friends, is a place where one encounters only provincials and foreigners. Parisians do not go there. Many excellent men in Paris do not even know where it is. Cease, then, once for all, to consider Montmartre the Acropolis of Paris. On our side, we long with all our hearts to know the truth about America.

III.

The truth is that the Americans are not mere money-makers, as they have been represented to us by recent books, solely occupied in amassing dollars. Certainly, they have a great deal of money, and I congratulate them. They proclaim, on all occasions, with a praiseworthy frankness, that money is, for the industrious, the surest means of making modern civilization, with its great and delightful advantages, flourish upon the earth. They understand the judicious use of money.

To begin with, the American women—who, I may say without flattery, are marvels of good-humor, of good health, and often of exquisite beauty—like fairies with a magic wand, transform money into an exquisite ornamentation of domestic life, by which the art of furnishing, aided by the enchanting illumination of electric chandeliers, metamorphoses the house into a habitation of happiness, which delights the eye and fills the heart with repose. The American home, arranged and decorated by feminine hands, is altogether delightful. It is good to live in it.

This is not all. I have remarked that everywhere America is a country of small houses and of huge buildings. Side by side with the pretty dwellings, in which furnaces keep up in the raw

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months of winter the temperature of spring, I have been amazed at the enormous structures whose multiplied stories are constantly linked together by the coming and going of the elevators. But what most astonished me, in my recent journey, were the magnificent universities which rise from the soil of the United States.

I saw, in succession, Harvard University and Radcliffe College at Cambridge; Yale University at New Haven; Trinity College at Hartford; Williams College at Williamstown; Brown University at Providence; Wellesley College; Mount Holyoke College; Columbia University at New York; Vassar College at Poughkeepsie; Adelphi College and Packer Collegiate Institute at Brooklyn; the University of Pennsylvania at Philadelphia; Princeton University; Cornell University at Ithaca; Wells College at Aurora, New York; the University of Chicago; Purdue University at La Fayette, Indiana; the University of California at Berkeley; and Tulane University at New Orleans.

Everywhere I admired the generous instinct which has caused these temples of learning to rise from the earth. The Americans have understood that material force is as nothing without moral power. They have desired to be as great through the impalpable prestige of the intellect as through the terrestrial royalty of silver and gold. For this reason men and women have rivalled each other in zeal and liberality in endowing these universities, most of which are young, and all strong and already mature. What an enthusiasm of generosity! With one accord millions have been poured out to form the endowments which are destined to support these laboratories, these libraries, these gymnasia, all this scholastic equipment, which tends to assure at the same time the mental and physical development of the new America. What is more significant than the emulation of the richest men of Chicago in creating, out of many fragments, the University of Chicago, the republic of learning of which Doctor Harper is president? Nor is that an undertaking more generous than that of Mrs. Phoebe Hearst, in gathering, at her own expense, a vast international assembly, so that in flower-clad California a university city might arise, whose marbles would glorify the sovereignty of the human intellect. Thanks to these memorable endowments, gold, in America, has become a fluid and ductile medium interchangeable with science and art. Certainly idealism is making progress, and the power of money will be ennobled. The Americans, inven-

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tive in everything, have made a new invention — the idealized dollar.

I am glad to see that in this enterprise of human culture the citizens of the United States are mindful of the ties which unite them to France, the dean of European nations.

The founders of the American universities, in forming the generous purpose of elevating the minds and hearts of their countrymen, have rendered homage to methods long since adopted by the French universities. In reading the courses of American institutions of higher learning, I see that a large space is reserved for the study of the literature of my own country. May one be permitted to wish that the list of authors drawn up by the professors and lecturers might be revised, and not limited to the most distinguished names only? While waiting for this indispensable amendment, I am pleased to see that the authorities of the American universities neglect no opportunity of manifesting their friendly feeling toward the French writers who visit the New World. The University of Chicago, in particular, through the combined efforts of President Harper and M. Mérou, the French consul at Chicago, concluded a treaty of friendship with the local section of *L'Alliance Française*. This event was celebrated by great festivities, at which M. Cambon, the French Minister to the United States, was present.

I am persuaded that the better France and America know each other, the better they will love each other.

GASTON DESCHAMPS.

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STRIKES IN THE UNITED STATES.

BY CARROLL D. WRIGHT, UNITED STATES COMMISSIONER OF LABOR.

THE statistical history of strikes in the United States covers the period of twenty years which closed with December, 1900. No attempt was made before then to collect data relative to labor controversies; yet, in the United States, as elsewhere, strikes in some form had been resorted to as a means of enforcing demands and obtaining redress of real or fancied grievances, although the method was not a general one. It was during the period designated that the strike assumed importance.

The first recourse to this method occurred in 1740 or 1741, when a combination of the journeymen bakers in the city of New York, formed for the purpose of demanding an increase in wages, resulted in a strike. The instigators were tried and convicted of conspiracy, on account of their agreement not to bake bread until their wages were raised. There is no account, however, of any sentence having been passed upon them. In 1796, the journeymen shoemakers in Philadelphia indulged in a strike or "turnout," as it was then called, the action being ordered by the organization representing the shoemakers, for the purpose of securing an increase of wages. This strike was successful. The same trade ordered another strike in 1798, for the same purpose and with the same result. The next year, the shoemakers of Philadelphia resisted, through a strike, a threatened reduction of wages; and after being idle about ten weeks made a compromise, so that the result was only partially successful. These were the only occasions on which strikes occurred in the United States before the nineteenth century. Industrial conditions were not particularly conducive to such controversies. Relations between masters and men were individual, so that concerted action among the men was seldom practicable.

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The first strike of any importance that occurred in the nineteenth century took place in the city of New York in 1803, and was known as the "sailors' strike." At the time of their demands, sailors had been receiving $10 per month. They sought an increase to $14. They organized a procession, compelling other seamen than those who organized the movement to join them, and thus the strike grew in proportions. The constables pursued the strikers and arrested their leader, who was lodged in jail. This terminated the difficulty.

The Journeymen Shoemakers' Association of Philadelphia, which originated the difficulties in 1796, 1798, and 1799, again sought through a strike in 1805 to secure an increase of wages. Their demands were somewhat exorbitant, ranging from 25 to 75 cents increase on each pair of shoes. After six or seven weeks of controversy the difficulty was closed, but without success to the strikers. They were, however, tried for conspiracy.

The cordwainers of New York organized a strike in November, 1809. It was at this time that a stoppage of work in a shop by the journeymen was called a strike. A general stoppage in all shops in a particular trade was known as a general "turnout," and a member of an association who did not keep his obligations to his organization was denominated a "scab." Other difficulties occurred in 1815 among the cordwainers in Pittsburg, the instigators being tried for conspiracy and convicted.

A very interesting strike occurred in Medford, Massachusetts, in 1817. Medford was a shipbuilding place, and a leading shipbuilder of that town determined to abolish the grog privilege customary at the time. So he gave notice to his people that no liquor should be used in his shipyard, and the words, "*No rum!* NO RUM!" were written on the clapboards of the workshop and on the timbers in the yard. Some of the men refused to work, but finally they gave up their contention.

From 1821 to 1834 there were several strikes, but not more than one or two in each year. They occurred among the compositors, hatters, ship-carpenters and calkers, journeymen tailors, canal laborers, the building trades, factory workers, shoemakers, and others. One of the most notable of these occurred in 1834 in the shoe-manufacturing city of Lynn, Massachusetts. The women shoebinders began to agitate the question of an increase of wages. They usually carried on their work in their homes.

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The employers were unwilling to increase the prices paid, and at a meeting of more than one thousand binders it was resolved that no more work should be taken home until the increase was granted. The employers refused to comply with the demands, and after four weeks of struggle the strike terminated unsuccessfully. The same year the female factory operatives at Lowell engaged in a disturbance to prevent a reduction of wages.

The "New York Daily Advertiser," in 1835, declared that "strikes are all the fashion," and, further, that "it is an excellent time for the journeymen of the country to come to this city." From that period strikes have been fairly common, often expensive, and destructive. There were no very notable strikes, however, until 1877, those which occurred prior thereto not being very important as to the number of persons engaged or losses or otherwise, although some of them were severe in the conditions accompanying them. After the year 1877, the greatest labor wars of the century occurred. There were strikes having a wide and far-reaching influence, which was felt in many directions, and involved the interests of parties not engaged. The first of what may be called historic strikes took place in 1877 on the Baltimore & Ohio Railroad, at Martinsburg, in West Virginia, on account of a threatened reduction in wages. The Pennsylvania Railroad Company was the victim of a most extraordinary strike, accompanied by riots and violence and the destruction of property, at Pittsburg, in 1877. The story of the difficulty is a very long one, and the strike itself was severe in every respect. Troops were called out, gatling guns were used, and the incident took on the form of war. The county in which the strike occurred was declared by the courts to be liable for all the losses sustained through riots accompanying the strike. The amount was over $3,500,000. The next great strike was that of the telegraphers, which occurred in the year 1883. This was followed by another memorable controversy which took place on the Southwestern or Gould system of railways in the years 1885-1886.

Without doubt, the most expensive and far-reaching of historic strikes was the strike of June and July, 1894, at Chicago. But the most interesting, thrilling, and dramatic incident or event in the labor movement of the country must be considered the Homestead affair of July 4th, 1892. The trouble grew out of a disagreement in the previous month regarding wages. On July

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4th, the officers of the Carnegie Steel Company asked the sheriff of the county to appoint deputies to protect the works, while they carried out their intention to make repairs. The employees, on their part, banded themselves together to defend the works against what they called encroachments or demands to enter; in other words, the workmen took possession of the Homestead steel works. When the sheriff's men approached, the workmen, who were assembled in force, notified them to leave the place. They offered, however, to act as deputies, which offer was promptly declined. On July 5th, a force of detectives, brought to the scene in barges, was met by a heavy volley of shots from the strikers, who were entrenched behind steel billets. The detectives were armed with Winchester rifles, but on landing they were obliged to ascend an embankment in single file, and so they were forced to retire, suffering from the opposing fire. Many efforts were made to reach the strikers, but without success, so strong was the position of the men behind their breastworks of steel. The battle continued throughout the day, and by the following morning the strikers had secured a ten-pound cannon, and planted it in such a way as to command the barges. About nine o'clock a regular bombardment commenced. The barges were protected by heavy steel plates; so the strikers made efforts to destroy them by floating burning oil to them, and by spraying the boats with oil at the same time by means of hose. The combined movements against the detectives obliged them to throw out a flag of truce. Seven men had been killed and twenty or thirty wounded in the battle. The arrival of troops on the 12th of July restored the town to order.

July, 1894, witnessed another severe labor war. This was what is commonly known as the Pullman strike at Chicago, which began with a private difficulty at the works of Pullman's Palace Car Company, and ended with a practical insurrection of the labor employed on the principal railroads radiating from Chicago and some of the affiliated lines, paralyzing internal commerce, putting the general public to great inconvenience, delaying the mails, and in general demoralizing business. The effects of this great strike were felt all over the country, for the contest was not limited to the parties with whom it originated. The strike was brought to a close not so much through the action of local police, State Militia, or the Federal troops, as by the action

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of the courts through the power of the writ of injunction. There were riots, intimidations, assaults, murder, arson, burglary, and lesser crimes. All the attending circumstances of the strike pointed to the one conclusion, that a share of responsibility for bringing it on belonged in some degree to each and every party involved in it. A great deal of very bitter feeling was generated. It was, however, one of the most suggestive strikes that have ever occurred, for it taught the public its rights in such matters.

The year 1894 may be called the high-water mark of labor controversies, so far as magnitude is concerned, although the statistics of other years show a larger number of establishments involved. The Lehigh Valley Railroad strike, which occurred in December, 1893, extending into 1894, the American Railway Union strike on the Great Northern Railroad in April of the latter year, and some others, emphasize the statement.

The latest of what may be called historic strikes are those of the anthracite coal regions and the bituminous coal strikes of 1894, 1897, 1900, and the so-called "steel strike" of the year 1901. The latter was a contest between the Amalgamated Association of Iron, Steel and Tin Workers and the United States Steel Corporation. It began on the first day of July, 1901, and lasted until September 15th, when work was resumed in accordance with an adjustment agreed to on the 13th of the latter month. The difficulty grew out of an attempt to adjust a sliding scale of wages with some of the constituent companies of the United States Steel Corporation, a new company having $1,404,000,000 capitalization which was perfected after the difficulty really began. The real nut of the difficulty was not a question of wages, hours of labor, or rules or conditions of work, but a contest for recognition of the right of the Association to demand the unionizing of mills, a demand, of course, which was positively refused by the United States Steel Corporation. It was the first great struggle in the United States that was conducted solely on this issue, which, indeed, has been contested many times, but usually in conjunction with some grievance or complicated with some demand as to wages or other economic conditions. The result was that the Amalgamated Association did not secure the terms demanded; and it lost further, because some of the mills which were subject to the union's rules were taken out and made non-union

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mills. It was a disastrous experience. In many respects, this steel strike is one of the most remarkable strikes of our time, yet it was conducted without any of the dramatic and tragic circumstances which attended the Homestead affair in 1892, in which the Amalgamated Association was one of the parties. In the difficulty of 1901, the Association did not have the hearty indorsement of a large number of workmen, as it was not a movement to redress any grievance.

The cost of the steel strike cannot be accurately gauged, but officers of the Amalgamated Association estimate that the number of men out of employment during the strike averaged 30,000 per day. There were at times very many more than this number out of work. The wages of the 30,000 men on strike averaged $3 per day, it is estimated. These are fairly conservative estimates; and, taking them for a basis, there must have been a loss of more than $4,000,000 in wages during the strike. The steel company, through its officers, has claimed that it experienced no great loss as the result of the strike.

With this statement relative to the past and concerning some of the more prominent and destructive labor wars of the past twenty years, it will be interesting to know the statistical history covering practically the strike period of the country. There are no statistics prior to 1880; in fact, the number of strikes which occurred annually before that time was so small that the statistical method could hardly be applied. From all accounts, gathered from various sources, the total number of strikes and lockouts in the United States from 1741 to 1880, inclusive, was 1,491, of which 813 occurred in the year 1880, and of those occurring in 1880, 618 were strikes, clearly defined as such. In 1879, there were only 51 conflicts, and this was the largest number for any year prior to 1880. From this statement it is seen that the real strike period of the United States begins with 1880, but the classified statistics begin with the year 1881; for the facts for 1880, collected at the time of the census of that year, were not classified as to losses, number of persons involved, etc., as they have been for the twenty years beginning with 1881.

From the Sixteenth Annual Report of the United States Commissioner of Labor the following tables, showing the main facts accompanying the strikes and lockouts for the period from 1881 to 1900, inclusive, have been constructed:

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STRIKES.

Year.	Number of strikes.	Establishments involved.	Employees thrown out of employment.	Average duration (days).	Wage loss of employees.	Assistance to employees by labor organizations.	Loss of employers.	Per cent. of establishments in which strikes—		
								Succeeded.	Succeeded partly.	Failed.
1881	471	2,928	129,521	12.8	$3,372,578	$287,999	$1,919,483	61.37	7.00	31.63
1882	454	2,105	154,671	21.9	9,864,228	734,339	4,269,094	53.59	8.17	38.24
1883	478	2,759	149,763	20.6	6,274,480	461,233	4,696,027	58.17	16.09	25.74
1884	443	2,367	147,054	30.5	7,666,717	407,871	3,393,073	51.50	3.89	44.61
1885	645	2,284	242,705	30.1	10,663,248	465,827	4,388,893	52.80	9.50	37.70
1886	1,432	10,053	508,044	23.4	14,992,453	1,122,130	12,357,808	34.50	18.85	46.65
1887	1,436	6,589	379,676	20.9	16,560,534	1,121,554	6,698,495	45.64	7.19	47.17
1888	906	3,506	147,704	20.3	6,377,749	1,752,368	6,509,017	52.22	5.48	42.30
1889	1,075	3,786	249,559	26.2	10,409,686	592,017	2,936,752	46.49	18.91	34.60
1890	1,833	9,424	351,944	24.2	13,875,338	910,285	5,135,404	52.65	10.01	37.34
1891	1,717	8,116	298,939	34.9	14,801,505	1,132,557	6,176,688	37.88	8.29	53.83
1892	1,298	5,540	206,671	23.4	10,772,622	833,874	5,145,691	39.31	8.70	51.99
1893	1,305	4,555	265,914	20.6	9,938,048	563,183	3,406,195	50.86	10.32	38.82
1894	1,349	8,196	660,425	32.4	37,145,532	931,052	18,982,129	38.09	13.50	48.41
1895	1,215	6,973	392,403	20.5	13,044,830	559,165	5,072,282	55.24	9.94	34.82
1896	1,026	5,462	241,170	22.0	11,098,207	462,165	5,304,235	59.19	7.47	33.34
1897	1,078	8,492	408,391	27.4	17,468,904	721,164	4,868,687	57.31	28.12	14.57
1898	1,056	3,809	*249,002	22.5	10,037,284	585,228	4,596,462	64.19	6.38	29.43
1899	1,797	11,317	417,072	15.2	15,157,965	1,096,030	7,443,407	73.24	14.25	12.51
1900	1,779	9,248	505,066	23.1	18,341,570	1,434,452	9,431,299	46.43	20.62	32.95
Total	22,793	117,509	*6,105,694	23.8	$257,863,478	$16,174,793	$122,731,121	50.77	13.04	36.19

* Not including the number in 33 establishments for which these data were not obtainable.

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LOCKOUTS.

Year.	Number of lockouts.	Establishments involved.	Employees thrown out of employment.	Average duration (days).	Wage loss of employees.	Assistance to employees by labor organizations.	Loss of employers.	Per cent. of establishments in which lockouts—		
								Succeeded.	Succeeded partly.	Failed.
1881	6	9	655	32.2	$18,519	$3,150	$6,960	88.89	11.11	——
1882	22	42	4,131	105.0	466,345	47,668	112,382	64.29	——	35.71
1883	28	117	20,512	57.5	1,069,212	102,253	297,097	56.41	——	43.59
1884	42	354	18,121	41.4	1,421,410	314,027	640,847	27.97	.28	71.75
1885	50	183	15,424	27.1	901,173	89,488	455,477	38.25	3.28	58.47
1886	140	1,509	101,980	39.1	4,281,058	549,452	1,949,498	21.18	13.11	65.71
1887	67	1,281	59,630	49.8	4,233,700	155,846	2,819,736	34.19	1.25	64.56
1888	40	180	15,176	74.9	1,100,057	85,931	1,217,199	74.44	3.89	21.67
1889	36	132	10,731	57.5	1,379,722	115,389	307,125	40.91	25.76	33.33
1890	64	324	21,555	73.9	957,966	77,210	486,258	65.74	5.56	28.70
1891	69	546	31,014	37.8	883,709	50,195	616,888	63.92	14.29	21.79
1892	61	716	32,014	72.0	2,856,013	537,684	1,695,080	69.13	25.28	5.59
1893	70	305	21,842	34.7	6,659,401	364,268	1,034,420	41.90	18.31	39.79
1894	55	875	29,619	39.7	2,022,769	160,244	982,584	11.31	2.40	86.29
1895	40	370	14,785	31.6	791,703	67,701	584,155	13.24	.27	86.49
1896	40	51	7,668	65.1	690,945	61,355	357,535	80.39	1.96	17.65
1897	32	171	7,763	38.6	583,606	47,326	298,044	60.82	3.51	35.67
1898	42	164	14,217	48.8	880,461	47,098	239,403	63.41	.61	35.98
1899	41	323	14,817	37.5	1,485,174	126,957	379,365	18.01	.62	81.37
1900	60	2,281	62,653	265.1	16,136,802	448,219	5,447,930	94.30	.31	5.39
Total	1,005	9,933	504,307	97.1	$48,819,745	$3,451,461	$19,927,983	50.79	6.28	42.93

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From the foregoing table relative to strikes—an analysis of the lockout table need not be attempted, as the lockouts constitute but a comparatively small proportion of industrial disturbances—it will be seen that the largest number of establishments involved in any one year was in 1899, being 11,317, and the next largest number was in 1886, being 10,053. The losses to employers and employees under all the conflicts, both strikes and lockouts, occurring in the period amounted to the enormous sum of $468,968,581, more than 6,000,000 persons having been thrown out of employment for an average of 23.8 days. It is often supposed that most strikes fail; but the foregoing record shows that 50.77 per cent. of the strikes succeeded, that 13.04 per cent. succeeded partly, and that 36.19 per cent. failed.

The figures in the tables do not represent the actual number of different individual employees who were involved in strikes or lockouts in a given year, because, in many cases, there have been two or more strikes or lockouts in one concern in the same year.

Of the whole number of strikes, 14,457 were ordered by labor organizations; these represented 103,455 establishments out of a total of 117,509. Of the strikes ordered by organizations, 52.86 per cent. were successful, 13.60 per cent. partly successful, and 33.54 per cent. unsuccessful. These percentages coincide very closely with those relating to the total number of successful, partly successful, and unsuccessful strikes.

The distribution of strikes offers occasion for some very serious reflections. During the twenty years included in the report, New York shows the largest number of strikes as well as the largest number of establishments affected, that State having 28.34 per cent. of the total number of strikes in the country during the whole period, and 32.20 per cent. of the total number of establishments involved. Pennsylvania follows, with 12.48 per cent. of the total number of strikes and 15.69 per cent. of the total number of establishments involved. Illinois had 11.58 per cent. of the strikes and 17.68 per cent. of the establishments affected.

In a group of States consisting of Illinois, Massachusetts, New York, Ohio, and Pennsylvania, there were 87,878 establishments under strike during the period, out of a total of 117,509 in the whole country; that is, in this group of States the establishments involved were 74.78 per cent. of all involved. These States contained 45.02 per cent. of all the manufacturing establishments

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and employed 55.15 per cent. of the capital invested in the mechanical industries of the United States.

As regards the employees involved in strikes, almost the same percentages are shown; but the industries most affected by strikes during the twenty years were the building trades, with 4,440 strikes, involving 41,910 establishments and 665,946 employees; coal and coke, with 2,515 strikes, involving 14,575 establishments and 1,892,435 employees; metals and metallic goods, with 2,080 strikes, involving 4,652 establishments and 511,336 employees; clothing, with 1,638 strikes, involving 19,695 establishments and 563,772 employees; tobacco, with 1,509 strikes, involving 6,153 establishments and 251,096 employees; and transportation, with 1,265 strikes, involving 3,436 establishments and 484,454 employees. It is thus seen that of the 22,793 strikes which occurred during the period, 59 per cent. were in the six industries just mentioned, while of the 117,509 establishments involved, 76.95 per cent. were so engaged. As regards the employees thrown out of employment by strikes, 71.60 per cent. of the total number were connected with establishments engaged in these six industries.

The leading causes or objects for which strikes were undertaken, together with the number and percentage of establishments falling under each general cause, are shown as follows:

Cause or object.	Establishments.	Per cent.
For increase of wages	33,731	28.70
For increase of wages and reduction of hours	13,201	11.23
For reduction of hours	13,116	11.16
Against reduction of wages	8,423	7.17
In sympathy with strike elsewhere	4,078	3.47
Against employment of non-union men	2,751	2.34
For adoption of new scale	2,742	2.33
For recognition of union	1,649	1.40
For increase of wages and recognition of union	1,111	.95
For enforcement of union rules	1,068	.91
For adoption of union scale	928	.79
For reduction of hours and against being compelled to board with employer	927	.79
Against task system	917	.78
For reduction of hours and against task system	901	.77
For adoption of union rules and union scale	880	.75
For reinstatement of discharged employees	868	.74
For increase of wages, Saturday half-holiday, and privilege of working for employers not members of masters' association	800	.68
Against reduction of wages and working overtime	750	.64
For increase of wages and against use of material from non-union establishment	750	.64
For increase of wages and Saturday half-holiday	729	.62
Total of twenty leading causes	90,320	76.86
All other causes (1,383)	27,189	23.14
Total for the United States	117,509	100.00

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It is interesting to note that the causes, grouped and classified, include 76.86 per cent. of all the establishments, leaving 1,383 causes, variously classified, active in only 23.14 per cent. of the establishments subject to strikes during the period. Three causes, involving increase of wages, reduction of hours, and reduction of wages, included 58.26 per cent. of all the establishments.

The success attending strikes, in relation to their causes, is very varied. Such results are shown in the following table:

Cause or object.	Per cent. of establishments in which strikes—		
	Succeeded.	Succeeded partly.	Failed.
For increase of wages	52.77	17.38	29.85
For increase of wages and reduction of hours	62.49	21.08	16.43
For reduction of hours	49.43	8.66	41.91
Against reduction of hours	32.54	13.14	54.32
In sympathy with strike elsewhere	25.03	2.33	72.64
Against employment of non-union men	67.21	1.38	31.41
For adoption of new scale	35.34	30.09	34.57
For recognition of union	12.37	——	87.63
For increase of wages and recognition of union	13.41	17.46	69.13
For enforcement of union rules	89.79	——	10.21
For adoption of union scale	46.23	.43	53.34
For reduction of hours and against being compelled to board with employer	32.47	——	67.53
Against task system	50.93	——	49.07
For reduction of hours and against task system	100.00	——	——
For adoption of union rules and union scale	64.20	5.23	30.57
For reinstatement of discharged employees	40.67	1.96	57.37
For increase of wages, Saturday half-holiday, and privilege of working for employers not members of masters' association	100.00	——	——
Against reduction of wages and working overtime	100.00	——	——
For increase of wages and against use of material from non-union establishment	——	——	100.00
For increase of wages and Saturday half-holiday	77.64	15.09	7.27
Total	50.44	13.53	36.03

Strikes to secure an increase of wages included 28.70 per cent. of all establishments involved, and of this number success resulted in 52.77 per cent. In strikes undertaken for both increase of wages and reduction of hours, 62.49 per cent. succeeded.

In considering all the data relative to strikes, it should be remembered that it is difficult always to state the facts with complete accuracy. This is especially true when dealing with losses. Taking strikes only, while the average duration of the strikes does not appear great in the aggregate, the number of days involved amounts to the enormous sum of 2,789,160—which, reduced, equals 7,641.5 years. The days so lost do not represent an absolute loss, as cessation of work or production often does away

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with the necessity of stoppage at some other time for restricting the output to the demands of trade or making repairs.

The figures relative to losses have been collected with the greatest possible care; and although in many cases only an estimate could be secured, the results given are believed to be a very close approximation to exact losses; but the figures are for the immediate, and in many instances only temporary, losses of employees and employers. The wage loss of the employees is the most exact statement as to losses. The employer may in some instances be subjected to an ultimate loss, by reason of his inability to fill contracts already made; so it is more difficult to ascertain his exact loss. The entire loss, as estimated, including the loss through assistance and all other facts relating to losses, it is believed, is much less than the real amount.

Whatever the exact truth, the approximate statements are sufficient to convince any right-minded person that every effort that can be made to adjust differences and deal with grievances in such a way as to prevent an open outbreak should be encouraged. Such attempts, where honestly and faithfully made, are leading everywhere, whether in the United States or in other countries devoted to manufacturing industries, to satisfactory results. The organization of private boards of arbitration now being resorted to in this country, following the long-successful example in the industries of Great Britain, is meeting with success. It is recognized now that labor conflicts grow out of increasing intelligence. The avoidance or adjustment of such conflicts must be the result of increased intelligence. Fools do not strike; it is only men who have intelligence enough to recognize their condition that make use of this last resort. With increased intelligence, they will look back upon the strike period as one of development; and when they shall have accommodated themselves to the new conditions, and when employers shall have recognized the increased intelligence of their employees, these matters will be handled in such a way as to prevent in the future a repetition of incidents like those which are chronicled in the statistical history of the strikes of the last twenty years.

CARROLL D. WRIGHT.

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MUNICIPAL SUPPRESSION OF INFECTION AND CONTAGION.

BY ERNST J. LEDERLE, PH.D., COMMISSIONER OF HEALTH, NEW YORK CITY.

MODERN conditions of life, more especially in great cities, have brought to the medical scientist and sanitarian a multitude of new problems in hygiene. Many of these problems have already been solved, in great measure as a result of progress in bacteriological study. The knowledge of hygienic principles gained by the scientific world in recent years has made of an empiric study an exact one, has lengthened the span of existence for every civilized being, and has saved the state in human lives the equivalent of millions of dollars annually. Yet men are only beginning to comprehend the great possibilities for the promotion of the health of the world which lie in the study of preventive medicine. The city of Havana is a striking example of what can be done in a short time. Since the American occupation, its death-rate has been reduced to that of New York. The twentieth century is likely to see the "ounce of prevention" system displace more and more the "pound of cure" plan which has burdened previous centuries. Preventive measures seem to be progressing faster, in almost every direction, than disease can spread; and, as a result of knowledge in these matters, a number of once formidable ailments have quite lost their terrors for the physician. New discoveries in preventive medicine are constantly coming to light, and the world may one day have at hand a remedy for most, if not all, of the diseases which now afflict humanity.

No branch of medical learning has progressed faster than the study of the infectious diseases. Many diseases long suspected to resemble in their origin those known to be infectious and communicable, have been definitely determined to be such. Others,

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which, within the lifetime of physicians still in active practice, were by none believed to be communicable, have been definitely established as belonging to the infectious class. In all research of this character, the bacteriologist has been the discoverer. The isolation of certain bacteria, each the cause of some disease, has by degrees established one after another disease as communicable. The next step was to note that patients who recover from many of the infectious diseases rarely contract them again. Upon this observation was based the theory that the human body itself acquires some antitoxin which not only kills the bacteria of the disease, but provides immunity against future attacks. When this theory was established beyond question for a number of the communicable diseases, the leaders in bacteriological study at once set about the artificial production of these mysterious immunizing agents. Success has rewarded their efforts in a sufficient number of instances to warrant the belief that all communicable diseases may one day be prevented in this way.

With all the facts which might be adduced to show the efficacy of preventive medicine, it seems strange that there are still persons who object to the use of serums in disease. A hundred years ago, it was regarded as only normal if smallpox, every year, was responsible for 150 out of every thousand deaths. Nowadays, however, under compulsory vaccination, smallpox claims only 5 or 10 in each thousand. What was begun with smallpox serum has been extended to other diseases. Between the epoch-making discoveries of Jenner and those of Pasteur and Koch, there was a lapse of eighty years, during which it may have seemed to the layman that no progress was made; but knowledge of various antitoxins is growing rapidly, and the successful use of three or four, in common employ now for several years, may be followed very soon by the production of other immunizing serums. At all events, the theory is established. Of the common forms of disease, it is true that the only complete success recently attained has been in the treatment of diphtheria; but in the last five years, the death-rate in cities using the serum has been reduced to less than one-half of the lowest death-rate recorded before the discovery of the diphtheria antitoxin. Partial success has been attained in inoculation against cholera and the plague; but for the two or three most fatal communicable diseases no satisfactory serum has yet been found.

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In default of specific aid from the bacteriologist, the sanitarian turns to hygienic principles in order to prevent the spread of diseases. Especially is this true in the treatment of contagious diseases in the great cities. In the rural districts, where there is room for every man to move about without jostling his neighbor, where there is pure air for all, and where the standard of living is high enough to embrace some, at least, of the cardinal principles of sanitation, infectious diseases have less opportunity to gain a foothold. But in the cities, the public medical adviser has to care, among others, for a great tenement population—ill-housed, ill-nourished, bred in the foul air of the slums; above all, ignorant of the laws of cleanliness and of right living, and willing to go to any lengths to hide the evidences of disease from the municipal physicians. Such people know nothing of the causes of contagion and feel no responsibility if they spread disease; in fact, the very ones who from their situation should be most careful of the health of their neighbors, are really least so.

But the poor in tenements are more sinned against than sinning, for the greed of landlords often stands in the way of better housing for the people. In New York, the devoted labors of sanitarians interested in improving tenement conditions resulted last year in the passage of a law governing the construction of tenements, and requiring that they be built with more attention to the sanitary needs of their occupants. But, at the following session, the Legislature was besieged by greedy landlords, and it required all the efforts of the Tenement House Commission, seconded by the Board of Health, to prevent the passage of amendments which would have quite emasculated the law, and led to the construction, in the newer sections of the city, of a form of tenements calculated to perpetuate all the evils now existing in the older slums. While it is not generally known, it may be stated here that, in some of the older wards in New York city, there are acres of land which hold between 700 and 800 people each; the most thickly populated acre in the Old World, by way of comparison, is said to be one in Prague, which "accommodates" 485 people. The average density of population in the whole of Manhattan Island is greater than in any other city of the civilized world; that is because three-fourths of the population live in tenements, piled tier on tier to the skies.

It is an accepted fact that an increased death-rate is an almost

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inevitable concomitant of increased density of population. The Registrar-General of England, some years ago, showed that, whereas the mean death-rate per 1000 in a district with only 166 persons per square mile was 16.75 per 1000, it was 38.62 per 1000 in a district where there were 65,000 persons per square mile. For the former section, the mortality of children under five years was 37 per 1000, while for the latter it was 139 per 1000—pitiful evidence, indeed, as to the expectation of life for the children of the tenements in our cities.

Extremely important in the suppression of contagion is a proper municipal supervision of the meat, milk, and water supply of the people. The extent to which this can be carried is shown by the fact that about ten million pounds of foodstuffs are annually seized and destroyed by the New York Board of Health. It is unnecessary to cite here the shocking disclosures of recent years with regard to the prevalence of tuberculosis in cattle, and the possible identification of human and bovine tuberculosis. Efforts to secure the destruction of tuberculous beef in the New York market, as well as to prevent the spread of the disease through the milk of infected animals, have resulted in a fairly satisfactory measure of co-operation between the New York Health Board and those of neighboring States; otherwise, it would have been impossible for the New York Board to exercise any control over sources of possible contagion outside its own jurisdiction. As it is, there is a careful inspection of all meat sent into the city, and carcasses found to be tuberculous are immediately destroyed.

Milk inspection, in the interest of a pure supply, plays an important part in efforts to check communicable disease. This inspection should be begun at the dairies and stables, where the bacteria found in milk first have an opportunity to breed. The milk ducts of a cow often give off thousands of bacteria to each cubic centimetre of milk; thousands of others are added in the process of milking, especially if the cow's udder and the attendant's hands are not clean. It is true that few of these bacteria are directly productive of communicable disease, but a number of kinds so modify the milk in their development as to render it injurious to the consumer. It is impossible to secure raw milk in any amount which is absolutely free from bacteria. The specifications for milk supplied to the contagious-disease

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hospitals under the control of the New York Board of Health call for a milk which contains not more than 60,000 bacteria per cubic centimetre, except in the months of May, June, July, and August, when the limit is 100,000 bacteria per cubic centimetre; milk of this standard is of recognized high quality. All milk dealers in New York city carry on business under permits revocable at the pleasure of the Health Board. Infectious diseases, not only tuberculosis, diphtheria, scarlet fever and typhoid, are not infrequently transmitted in milk which has been contaminated either at the dairy or in the stores of retailers where disease has occurred. It is important that the vender shall not keep or store milk in any room used for sleeping or domestic purposes, or opening on such rooms. Stringent rules must also be enforced regarding the transfer of milk from cans to bottles on streets or at ferries or depots, and for the protection of milk receptacles from the dust and impurities of streets.

Contamination of milk with typhoid germs results from the use of infected water in washing the cans or other utensils. But typhoid fever is more commonly transmitted by the direct contamination of water supplies. The health authorities of New York city long since stopped the use of all shallow wells on Manhattan Island, but typhoid outbreaks still occur in localities where the water used by the inhabitants is subject to sewage contamination. Notable in this respect was the outbreak in Philadelphia four years ago; about three times the usual number of cases of typhoid were recorded during the epidemic, and of these some 65 per cent. were found in a section of the city containing only one-fifth of the total population. On tracing the sources of infection, it was found that all these cases were due to the accidental overflow of a sewer into the Schuylkill River at a point just above the intake of one of the reservoirs. The lesson is obvious, especially when sanitarians recall that in cities like Munich or Vienna, which draw their waters from pure mountain springs, the deaths from typhoid number only four in each 100,000 of population, while in cities like Philadelphia, Washington, Albany, Pittsburg, Cincinnati, and Louisville, which still use water from wells in populous districts, and from rivers known to be polluted with sewage, the death-rate from typhoid averages sixty per 100,000 inhabitants.

Perhaps the greatest opportunity which is offered to the mu-

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nicipal sanitarian to promote the health and happiness of mankind, lies in measures to prevent the spread of tuberculosis; but, unhappily, there is no opportunity to which cities have been so blind. Municipal governments in the United States which have thus far adopted effective prophylactic systems may be numbered on the fingers of one hand, and this in spite of the fact that the medical profession is already well aware of the wonderful results which follow radical preventive measures.

Tuberculosis takes away from a quarter to a third of the persons who sicken and die during the best and most productive period of life; and yet it has been shown in New York city, to go no further afield, that the spread of this disease is readily preventable, if proper hygienic measures are taken. The hygienic measures, when fitly practised, should cover all the places where consumptive persons may have been —the home, the public conveyance, the factory, the store, and even the public streets. The plan of safeguarding the general public against tuberculosis, as it is now in operation in New York city, has already produced such remarkably good results that it is difficult to see how any important city in the land can fail to adopt similar, or even more rigorous, measures. The ordinance which brought pulmonary tuberculosis under the control of the New York Board of Health was not adopted until 1897, although recommended nearly ten years prior to that time. The disease was then declared infectious and communicable, and every physician in the city was required to report in writing the name, address, occupation, etc., of every person suffering from tuberculosis, who had come under the observation of the physician. Furthermore, every person suffering from the disease, and every person in attendance upon any one so suffering, was by this ordinance required to observe and enforce all the rules of the Board of Health which aim to prevent the spread of tuberculosis. The adoption of the compulsory notification requirement raised a storm of protest from the various medical bodies in New York city, but without avail; and the results have already shown the wisdom of the procedure, while all the leading physicians are now heartily in accord with the plan.

Compulsory notification is the keynote of the system. It gives opportunity at once for the necessary sanitary measures. Inspectors from the Board of Health are enabled thus to visit tene-

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ment houses, lodging-houses, hotels, etc., and instruct the consumptives as to the necessary precautions to be taken for their own good, as well as for the safety of persons about them. Disinfection, and what is still more efficacious, complete renovation of all premises where a death from tuberculosis has occurred, are, when necessary, ordered by the Board of Health; and advanced cases are moved to hospitals (with their own consent) so far as it is possible to provide hospital accommodations. Many opportunities also arise for the removal to rural sanitariums of persons who have recently contracted the disease. In this way the Board of Health is able to follow up each tuberculous case at the home, or the workshop, factory, or office, and protect the patient's neighbors from infection. Registration facilitates satisfactory supervision over the disease, and helps the Board of Health to discern where the chief efforts should be put forth. For example, it has thus been shown that, in several separate blocks in the lower part of the city, more than one hundred cases of tuberculosis have occurred within five years; and there are certain houses in New York which have had between twenty and thirty cases in that time. One of the blocks in the Chinese quarter, with a population of 2100 persons, had more than 200 cases of tuberculosis in five years; and it is likely that the number reported would have been larger had the system of registration then been as complete as it is now.

In addition to the inspection and renovation of houses where tuberculosis cases have occurred, much is being done to restrain people who spread infection by constant expectoration. It has been shown conclusively that a spitter who is suffering from a disease of the respiratory tract may, if allowed to continue his operations without control, provide infective material for hundreds, if not thousands, of persons during the slow progress of his disease. It seems probable that a number of diseases besides consumption are transmitted in this way. It is for this reason, even more than on the score of public decency, that drastic measures are taken to restrain the man who spits in public places. In New York, the practice is to send out police officers dressed in citizens' clothes to arrest all persons found spitting in public conveyances. The spitter, as a rule, evinces violent opposition to arrest, and seems to think that it is an infringement on his personal liberty. Especially is this true of the large foreign-born

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element in New York's population. All are treated alike, however, when they are brought before the magistrate; and it is customary to fine them between one and ten dollars when they are taken in the act. In the long run, this system of arrest and fine will probably accomplish the objects sought, as no violator of the law can tell when he may be caught and arrested. It is noticeable that, so far as is known at this time, no spitter has ever been taken in a second offence, so that in all probability the lesson of arrest and punishment is an effective one.

The mortality from tuberculosis in New York city has been reduced about 35 per cent. in the last fifteen years, chiefly as a result of preventive measures, though these are as yet in their infancy. A satisfactory system of caring for tuberculous patients would include municipal sanitariums in favorable locations outside the city; but this enterprise seems to need the aid of a Carnegie or a Rockefeller, for city authorities are not yet willing to undertake the expense involved. The disease now costs New York city annually from nine to ten thousand lives, the value of which, according to the statisticians, is fully ten million dollars. It has been said by the best authorities that an extension of prophylactic measures—to include suitable hospitals and complete enforcement of the existing regulations—would result in the saving of from 2000 to 3000 lives annually in New York city. The cost of this work would be extremely small, probably not a hundredth part of what New York is spending on rapid transit, bridges, schools, and similar public improvements.

Of prime importance in the suppression of contagion in all its forms is an efficient system of medical inspection in schools. As practised in New York city, this work is under the care of a special corps of physicians, detailed to visit the schools, and examine all children who have been isolated by the teachers as not appearing entirely well. The scope of this work may be imagined when it is said that a total of nearly 100,000 visits are made annually to the public schools, in the course of which upwards of 125,000 children are examined, and from 10,000 to 15,000 excluded as having contagious disease in one form or another. A large proportion of the contagious-disease cases occurring in New York, however, are reported by private practitioners, who are visited with censure and sometimes with fines for failure to make such reports. Diagnosis of each individual case follows, and the

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patient is either removed to a contagious-disease hospital, or placed in charge of a district inspector, whose duty it is to watch the progress of the case, and take measures to prevent the spread of the disease to other persons in the neighborhood. The results of the preventive system in recent years have been profoundly important. The death-rate in the diseases to which children are especially subject shows a remarkable shrinkage. Especially is this true in diphtheria and croup, the mortality from which had been quite steadily increasing in New York up to the year 1895. At that time began the treatment with diphtheria antitoxin, and since then the mortality from diphtheria has been reduced fully one-half—a saving of several thousand lives every year.

Any review, however cursory, of measures for the suppression of contagion would be incomplete without a word about the checking of smallpox, which has been so prevalent in the United States in the last two years as to be almost epidemic. Its spread has been unquestionably due to laxity in vaccination work in various sections of the country. Contagion was brought here from Europe in considerable amount in 1900, and the disease has since been spreading, in the winter months, to a large number of the unvaccinated. Federal control of preventive measures is needed to secure a uniform enforcement of them; at present, the work of any particular city in checking smallpox is in great measure nullified by the laxity of other cities. The prevalence of the disease has revived discussion of plans for compulsory vaccination. There is no doubt of the efficacy of that system; an example of it is found in the course of smallpox in a state like Prussia, where, since compulsory vaccination was put into practice twenty-five years ago, the death-rate from smallpox has fallen from 36 per 100,000 to 0.49 per 100,000 inhabitants. At the same time, there has been so little opposition to vaccination in New York city that compulsion by State enactment has been deemed unwise. It seems probable that in the last two years fully one-third, if not one-half, of the population of New York has submitted to vaccination, and the good results of this are likely to be seen next winter, if they are not already apparent.

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HOW TO CURB THE TRUSTS.

BY HENRY MICHELSEN.

ON November 18th, 1601, the Commons of England resolved that:

"Whereas, numerous commodities, among which are several of universal consumption and the first necessity, have of late years been advanced to double the usual price, and the representatives of most counties and boroughs have been instructed by their constituents to demand abolition of so oppressive a grievance, the Commons appeal to the Queen's Highness for redress."

On November 25th, Elizabeth assured the Speaker, in the presence of her Council, that she never signed a patent of monopoly till she had been told it would prove beneficial to the nation; she thanked the members who had brought the abuse to her knowledge; she promised him that she would, by proclamation, revoke every patent prejudicial to the liberties of the subject, and that she would suspend all others till their validity should be ascertained in the courts of law. This action of the great queen ended the reign of monopolies in her own time, and has stood for three hundred years as a model of governmental tact.

The commercial conditions existing in 1902 within the fiscal borders of the American Republic are curiously similar to those of which the Commons complained to Elizabeth. The necessities of life are in the control of monopolies. Whatever is required by the consumers is subject to the dictum of irresponsible combinations. So great has the evil grown that, in some instances, the people have not waited for the action of their servants in Congress, but have taken the initiative by declining to purchase the articles offered under a system of boycotting. If this practice should spread, it would mean, on the part of the law-making authorities, the abdication of their proper functions,

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and a confession of their impotence to cope with an evil the prevalence of which is acknowledged.

Forty years ago, the party at present in power inaugurated the American System. Its financial policy has been based upon high import duties, professedly enacted because of its solicitude for the protection of the American working-man. The party referred to won the last election by promising "a full dinner-pail for four years more." It rode into power upon this issue; it will be held responsible for its fulfilment. The success of the American System is predicated upon the well-being of the laborer. An abundance of cheap, wholesome food, of suitable clothing, of comfortable dwellings, of all the requirements for a decent life, has made it possible for the operatives of our manufactories to produce better and cheaper articles for distribution in the world's trade, within fewer daily hours of labor, than the workmen in any other nation. The markets of the world are ours because hitherto our operatives have been prosperous. A system of taxation which must prove destructive to this prosperity would be wrong, even if it were enacted to meet the necessities of the body politic; it is criminal, when it is imposed for the advancement of private interests and uncontrolled by those to whom the people have intrusted the management of their affairs.

Combinations of industrial enterprises for the undue enhancement of the value of their products, are made possible by the state of the transportation system of the country. The reports of the Interstate Railroad Commission, the official authority upon this subject, abound with admissions to this effect. Were railroad rates equal, as they ought to be under the expressed designs of the statute, and were it possible under existing circumstances to adjust them in such a manner as to serve the purposes of the nation at large, a method of distribution of commodities might be secured which would enable the people to obtain the legitimate reduction in prices that ought to result from the facilities of production. Under the present methods, this cannot be achieved. The advent of cheaper power, increased outputs, more economical handling of raw materials, has been accompanied by a rise in the prices of all the articles of daily consumption.

The price of meat, the article of consumption which forms, next to bread, the most important food for the eighty millions of our citizens, is fixed by half a dozen monopolists. Their business

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is one which prohibits any kind of competition, and they exploit the nation. It is reported that the net earnings of the Meat Trust during the year 1901 amounted to one hundred millions of dollars more than in 1900. Each pound of meat has risen in price by from three to five cents. It is not the lack of cattle which has caused this rise in values; for this country supplies a great part of the civilized world with flesh foods, and a rational management of existing ranches would readily yield a still greater increase of stock-cattle than is obtained at present. Nor is the expense of administration of packing-houses excessive; for in these plants the scientific disposition of all material tends to utilize all of the substances handled, and to minimize waste. The grower of cattle does not derive any advantage from the gain of the packer; the Trust dictates prices both for the raw material purchased and for the product sold by it. By its "route" cars, which are perambulating butcher-shops, it has destroyed the retail business of the dealers in small towns. Its business transactions amount to six hundred millions of dollars annually, and they are growing with the natural increase of the population. While prices within the United States have been advanced continually, those charged European consumers have been adapted to the local state of each market. Thus American meats are cheaper in London or Liverpool than in New York or Chicago—the frozen meats of Australia and free trade necessitating the reduction. During the year 1901, about a hundred millions of dollars' worth of meats were distributed by American packers in European markets, a fact which indicates no lack of range cattle. The existence of this Trust has become possible by reason of its relations to the transportation companies. Cold storage on cars and steamboats, reduced freight rates, and the preferences given to these large concerns in railroad car service, have made it impossible for individuals to attempt competition.

The Millers' Trust has so depressed the price of wheat and other cereals as to compel their exportation to foreign mills for grinding. To clinch their control upon the whole cereal output of the country, the members of this Trust now urge the railway companies to give them such transportation rates as will compel the American farmer to have his grain converted into flour within the borders of this country. If ever this demand is complied with, the production of our staple grains will shrink, because

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the Trust does not allow the producer a margin sufficient to live upon. At the same time the average domestic price of flour has been enormously advanced.

The Wool Trust has depressed the values of the Western staple, until it is doubtful whether the flocks can be maintained upon the free range of the desert and leave a profit to their owners. And at the same time the transportation rates have been made much higher than they were when wool commanded a price double that paid to the producer now.

California complains that her orange crop must rot upon the ground, because the facilities offered by the transportation companies are inadequate to take this harvest to the markets. Nevada, Arizona, New Mexico, Utah, Idaho, Wyoming, Montana assert that the long-haul system keeps their territories from being developed, it being the maxim of railroad companies that it is better to bring manufactured goods into undeveloped countries from afar at high rates than to permit the building up of industries which would only yield local rates. Thus, the lumber industry of the Pacific Coast is being confined to the procurement of raw material, because it pays the roads better to haul the manufactured articles three thousand miles across the continent than to permit the establishment of pulp mills, or wagon and agricultural implement factories, at the places where the lumber required for these industries is most easily obtained. The mining States of the West complain bitterly about the curtailment of the output of their minerals, brought about by the combination between the railroads and the American Smelting and Refining Company. Granger legislation is imminent in the States of the Middle West, to cope with advanced rates upon the products of their corn-fields caused by the co-operation of railways with the Elevator Trust. In fact, the productive and commercial forces of the country are suffering vexatious annoyances from the anarchic transportation conditions, conditions wasteful, cumbersome, unscientific, unworthy of the genius of the American people.

The existing state of affairs, however undesirable it may appear, has been brought about in a perfectly legitimate manner. A fertile continent had to be opened to civilization. The available means of communication were inadequate. Enormous investments were necessary to build the lines of railways required,

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to equip them, to handle the administrative organizations needed in the employment and control of a million of operatives. Of financial aid, such as has been lavishly supplied by other governments, our railroads obtained little. The establishment of the business of the nation upon its present large scale is due to the genius and administrative ability of the men who handle its railways. The rates of freight and passenger traffic are low, compared with those exacted abroad. The service is being improved year after year. What the public complains of is, not that the transportation lines are wilfully and arbitrarily exacting, by means of excessive rates, undue advantages for themselves, but that they discriminate in favor of trusts and corporations, thus destroying the chances of individual citizens, retarding the establishment of new enterprises and placing the control of the markets in the keeping of the favored few, who in turn coerce the railroads into a continuance of these discriminations.

To develop the resources, now dormant, of agriculture, of the metalliferous and carboniferous mines, of the oil lands, of the forests; to cause the arid territories of the western half of the country to attain their full productive values; to manufacture out of our abundant raw materials the commodities required in the commerce of the world; to obtain control of foreign markets; it is necessary to have recourse to the enactment of the one great measure here proposed—the nationalization of the railways.

That the framing of so great a law will require statesmanship of the highest order, is admitted. That constructive legislation more comprehensive than has ever been effected will have to be placed upon the statute book, is granted. That this legislation will be difficult to achieve, that it may be tentative at its inception, liable afterwards to revision, as requirements may arise, is readily allowed. But the time has come for it, and the obstacles will vanish as its scope and effects shall become apparent.

The railway system of the country has lately passed into the possession of a small number of people. As consolidation progresses, it is unavoidable that a degree of mutual understanding between the holders of these properties must be established. Not designedly, but by reason of the inherent conditions of the business, these combinations of capital must progress in ever-increasing proportion, until it may become a question whether the real power of the nation is lodged in the government created

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by the Constitution, or within the keeping of an irresponsible coalition of accumulated wealth. For the dignity of the government, it will be requisite to substitute for the crude and archaic legislation now in force, a comprehensive statute which will guard and promote the welfare of the whole people.

The principal arguments against the nationalization of the railroads are:

(1) The cost of the scheme;

(2) The great accumulation of wealth into few hands consequent upon the purchase of the lines by the government;

(3) The effect upon the electorate, by the creation of a large office-holding class dependent on the party in power.

As to the cost of the scheme, it is not proposed that the government shall pay more than is warranted by the intrinsic value of the property. In the appraisement of public property, the government has always been served quite as well as individuals. The transfer would, of course, have to be effected under proper safeguards, very much after the manner in which European governments have proceeded. The making of an investment of this magnitude would not frighten the American people in the prevailing state of financial enterprises, more especially since the effect would be felt to be beneficial almost at once after its consummation. Absolutely equal and open rates would control the industrial combinations, multiply the means of exchange, stimulate agriculture equally with manufactures, and enhance the growth of rural and civic communities in a uniform and progressive measure. The country would, by the development of its natural resources, which should be made the principal task of the department having charge of the transportation system, become the workshop of the nations; and a general prosperity must ensue of which it is difficult to form a conception.

As to the accumulation of wealth in a few large holdings, the present system has a tendency to bring about this result by the increment in the value of proprietary railway investments. Stocks which were considered of little value a few years ago have become worth many times the prices demanded for them during the period of depression; while debentures have sunk in capital value and interest paid. A purchase of the titles to the railways would, very likely, be effected by means of bonds, bearing a very low rate of interest, redeemable after a reasonable length

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of time at the option of the government. Since the interest earned by these bonds would not prove attractive to great financiers, who are accustomed to much larger profits, the consequence must be that these securities would be employed as bases for other investments. When it is considered that one-half of the territory of the United States is quite undeveloped, owing to lack of capital; that a rich soil merely awaits the distribution of water by means of irrigation canals; that thus vast areas now barren may be made to sustain a population as dense as that of other civilized countries; that the mines of this continent are only in the very first stage of their development; that the manufacturing interests of the trans-Missouri country have not been evolved, while the factories of the Eastern States are unable to accept orders unless they are allowed months in which to fill them; we may feel assured that the money to be distributed in the purchase of railway properties will find many and abundant channels for investment. It is certain that no inconvenience has arisen from the nationalization of the German railroads to the people of that empire, and there is no reason why the same measure should affect our people in a different way.

As regards the creation of an office-holding class, it may be said that in the railway service this class exists already. As it has not been deemed requisite to disfranchise the employees of the postal establishment nor any of the other servants of the government's civil organization, it does not appear that a necessity for such a measure will arise concerning the railway men. Numerous attempts have been made, time and again, by railway officials to control the vote of their employees, always to the discomfiture of those who made the effort. The electorate will be swayed by political and economical considerations, and parties will achieve success or failure at the hustings exactly as heretofore, according to the records presented by them, as long as the Republic lasts.

Taxation is a function of government. It must not be delegated by those responsible for its proper enactment to any other authority. If existing institutions are not adapted to the protection of the general welfare, then it becomes the duty of the law-making powers to create others which will bring about the results required.

HENRY MICHELSEN.

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RICHARD STRAUSS AND HIS MUSIC.

BY GUSTAV KOBBÉ.

RICHARD STRAUSS—a new name to conjure with in music! His banner is borne by a band of enthusiasts like those who, many years ago, carried the flag of Wagner to the front. "Did not Wagner put a full stop after the word music?" some will ask in surprise. "Did he not strike the final note? Are the 'Ring,' 'Tristan' and 'Parsifal' not to be succeeded by an eternal pause? Is there something still to be achieved in music as in other arts and sciences?"

Something new certainly has been achieved by Richard Strauss. It forms neither a continuation of Wagner nor an opposition to Wagner. It has nothing to do with Wagner, beyond that Strauss appropriates whatever in the progression of his art the latest master has a right to take from his predecessors. Strauss is, in fact, one of the most original and individual of composers.

He has been a student, not a copyist, of Wagner. Thus, where others who have sat at the feet of the Bayreuth master have written poor imitations of Wagner, and have therefore failed even to continue the school, giving only feeble echoes of its great master, Strauss has struck out for himself. With a mastery of every technical resource, acquired by deep and patient study, he has given wholly new value and importance to a form of art entirely different from the music drama. The music of the average, modern Wagner disciple sounds not like Wagner, but like Wagner and water. Richard Strauss sounds like Richard Strauss.

One reason for this is that his art work, like Wagner's, has an independent intellectual reason for being. Let me not for one moment be understood as belittling Wagner, in order to magnify Strauss. Wagner is the one creator of an art-form, who also seems

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destined to remain its greatest exponent. Other creators of art-forms have been mere pioneers, leaving to those who have come after them the development and rounding out of what with them were experiments. The story of the symphony may be said to have begun with Philipp Emanuel Bach and to have been "continued in our next" to Beethoven, with "supplements" ever since. The music drama had its tentative beginnings in "The Flying Dutchman," its consummation in "Parsifal." The years from 1843 to 1882 lay between, but the music drama was guided ever by the same hand, the master hand of Richard Wagner. No, it would be self-defeating folly to make Wagner appear less in order to have Strauss appear more.

Nor does Richard Strauss require such tactics. He has made two excursions into music drama and he may make others. But his fame rests mainly upon what he has accomplished as an instrumental composer, and in the self-created realm of the "Tone Poem." Tone poem is a new term in music. It stands for something that outstrips the symphonic poem of Liszt, something larger both in its boundaries and in its intellectual and musical scope. Strauss did not limit himself by the word symphonic. He leaves himself free to give full range to his ideas. A composer of "programme music," his works are so stupendous in scope that the word symphonic would have hampered him. His "*Also Sprach Zarathustra*" ("Thus Spake Zarathustra") and "*Ein Heldenleben*" ("A Hero's Life") are not symphonic poems, but tone poems of enormous proportions.

These, his last two instrumental productions, together with the growing familiarity of the musical public with his beautiful and eloquent songs, established his reputation in this country. To-day, a Strauss work on a programme means as much to the musically elect as a Wagner work meant a quarter of a century ago. In fact, to advanced musicians, to those who are not content to rest upon what has been achieved, but are ready to welcome further serious effort, Strauss's works form the latest great utterance in music. Let me repeat *verbatim* a conversation that occurred on a recent rainy night, the date of an important concert.

HE: "Are you going to the concert to-night?"

SHE: *(Looking out and seeing that it still is raining hard)* "Do they play anything by Richard Strauss?"

HE: "Not to-night."

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SHE: "Then I'm not going."

This woman could meet the most enthusiastic admirer of Beethoven or Wagner on his own ground. But when she heard "*Ein Heldenleben*" under Emil Paur's bâton at a concert of the New York Philharmonic Society, she heard what she had been waiting twenty years for—something new in music, that also was something great; something that was not merely an imitation of what she had heard a hundred times before, but something which pointed the way to untravelled paths. It always is woman who throws the first rose at the feet of genius.

One first looks at Richard Strauss in mere amazement at the size of what he has produced. "Thus Spake Zarathustra" lasts thirty-three minutes, "A Hero's Life" forty-five. This initial sense of "bigness," as such, having worn off, one becomes aware of marvellous tone combinations in orchestral effect. Listening again, one discovers that these daring instrumental combinations have not been entered into merely for the sake of juggling with the orchestra, but because the composer, being a modern of moderns, has the most modern message in music to deliver, and, in order to deliver it, has developed the modern orchestra to a state of efficiency and versatility of tonal expression beyond any of his predecessors. Richard Strauss scores, in the most casual manner, an octave higher than Beethoven dared go with the violins. When Beethoven had carried the violins as high as the F above the staff, he stopped. What should have been higher he wrote an octave lower. All the strings in the Richard Strauss orchestra are scored correspondingly high. But this is not done as a mere fad. What Richard Strauss accomplishes with the strings is not merely queer or bizarre. What he seeks and obtains is genuine, original musical effects. Often the highest register is used by him in a few of the strings, because, for certain polyphonic effects—the weaving and interweaving of various themes—he divides and sub-divides all the strings into numerous groups. For the same reason, he has regularly added four or five hitherto rarely used instruments to the woodwind and scores, regularly, for eight horns, besides employing from four to five trumpets.

While he has increased the technical difficulties of every instrument, what he requires of them is not impossible. He does, indeed, call for first-rate artists in his orchestra; but so did Wag-

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ner as compared with Beethoven. He knows every instrument thoroughly, for he has taken lessons on all; and, therefore, when he is striving for new instrumental effects he is not putting problems which cannot be legitimately solved. His "Till Eulenspiegel's Merry Pranks" makes, possibly, the greatest demand of all his works on an orchestra. But, if properly played, it is one of the most bizarre and amusing *scherzos* in the répertoire. In his "Don Quixote," he has gone outside the list of orchestral instruments; and in the scene where Don Quixote has his tilt with the windmill, he has introduced a regular, theatrical wind-machine. And why not? The effect to be produced justifies the means. There is an *a capella* chorus by Strauss for sixteen voices. These are not divided into two double quartettes, or into four quartettes, but the composition actually is scored in sixteen parts. He shrinks from no musical problem.

When Mr. Paur produced "A Hero's Life" in New York, he had an orchestra of 125. Given at a public rehearsal and concert of the Philharmonic, it made such a profound impression—it was recognized as music, not as mere bulk and noise—that it had to be repeated at a following public rehearsal and concert, thus having the honor of four consecutive performances by the same society in one season. Previous performances of Strauss's works, mainly by the Chicago Orchestra, under Thomas, and the Boston Symphony Orchestra, had begun to direct public attention to this composer. But the "*Heldenleben*" performances by the Philharmonic created something of a sensation. They made the "hit" which the public unconsciously had been working up to for several seasons. Large as are the dimensions of "A Hero's Life," Richard Strauss had chosen a subject that made a very direct appeal. Despite its wealth of polyphony and theme combination, the score told, without a word of synopsis, a clear intelligible story of a hero's material victory, followed by a greater moral one. It placed the public on a human, familiar footing with a composer, whom previously they had regarded with more awe than interest. Here was music interesting as mere music, but all the more interesting because it had an intellectual message to convey.

What is the difference between classical and modern music? Write a chapter or a book on it, and the difference still remains just this: Classical music is the expression of beauty; modern

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music the expression of truth. Modern music seems entering upon a new era with Strauss. It is beginning to illustrate itself, so to speak, like the author-artist who can both write and draw. To-day, music not only expresses truth, but represents it pictorially. How long will the time be in coming when a composer will wave his bâton, the orchestra strike a chord—and we be not only listeners but also beholders, hearing the chord, and seeing at the same time its image floating above the orchestra?

In his "Melomaniacs," the most remarkable collection of musical stories I have read, Mr. Huneker has a tale called "A Piper of Dreams," the most advanced piece of musical fiction I know of. This piper of dreams produces music which is *seen*. "Do you know why you like it?" Mr. Huneker asked me, when I told him how intensely I admired the story. "Because," he continued, "the hero of the story is Richard Strauss."

Of course, this brilliantly written story was a daring incursion into a seemingly impossible future. Yet it points a tendency. When shall we have music that can be seen? Considering how closely related are the laws of acoustics and optics, is a "Piper of Dreams" so visionary? Who knows but that the music of the future may be visible sound—the work of a piper of dreams? Sometimes, when listening to Strauss, I think Mr. Huneker's "Piper" is tuning up.

Richard Strauss's tone poems are large in plan. In fact, they are colossal. They show him to be a man of great intellectual activity, as well as an inspired composer. The latter, of course, is the test by which a musical work stands or falls. No matter how intellectually it is planned, if it is inadequate musically it fails. But if it is musically inspired, it gains vastly in effect when it rests on a brain basis.

That Richard Strauss is the most significant figure in the musical world to-day seems to me too patent to admit of discussion. The only question to be considered is, how has he become so? The question is best answered by showing what a Richard Strauss tone poem is. Take the two latest, those which mark the climax of his achievement—"Thus Spake Zarathustra" and "A Hero's Life." Without going into an elaborate discussion I must insist that, to consider Richard Strauss as in any way a development from Berlioz or Liszt, shows a deplorable unfamiliarity with his works. Berlioz wrote programme music.

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Liszt wrote programme music. Richard Strauss writes programme music. But this point of resemblance is wholly superficial. Berlioz admittedly strove to adhere to the orthodox symphonic poem. Liszt aptly named his own productions "symphonic" poems. They are much freer in form than Berlioz, and possibly pointed the way to the Richard Strauss tone poem. But when we examine the musical kernel, the difference at once is apparent. Polyphony, that is, the simultaneous interweaving of many themes, was foreign to Berlioz and Liszt. Their style is homophonic. Richard Strauss is a polyphonic composer second not even to Wagner, whose system of leading motives in his music dramas made his scores marvellous polyphonic structures. Such, too, are the scores of Richard Strauss's tone poems. None but a master of polyphony could have attempted to express in music what Richard Strauss has expressed. For are not his tone poems literally tone dramas?

It was like a man of great intellectual activity, such as Richard Strauss is, to select for musical illustration the Faust of modern literature—Nietzke's "Zarathustra." The composer became interested in Nietzke's works in 1892, when he was writing his music drama, "Guntram." The full fruition of his study of this philosopher's works is "Thus Spake Zarathustra." But this is not an attempt to set Nietzke to music, not an effort to express a system of philosophy through sound. It is rather the musical portrayal of a quest—a being longing to solve the problems of life, finding at the end of his varied pilgrimage that which he had left at the beginning, Nature deep and inscrutable.

Musically, the great *fortissimo* outburst in C major, which, at the beginning of the work, greets the seeker on the mountain top with the glories of the sunrise, is the symbol of Nature. The seeker descends the mountain. He pursues the quest amid many surroundings, among all sorts and conditions of men. He experiences joy, passion, remorse. In wisdom, perchance, lies the final solution of the problem of life. But the emptiness of "wisdom" is depicted by the composer with the keenest satire in a learned, yet dry, five-part fugue. The seeker's varied experiences form as many divisions of the tone poem. There even is a waltz theme. Unending Joy! Therein he may reach the end of his quest.

But hark! a sombre strophe, followed twelve times by the even

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fainter stroke of a bell! Then a theme winging its flight on the highest register of modern instrumentation, until it seems to rise over the orchestra and vanish into thin air. It is the soul of the seeker, his earthly quest ended; while the theme which greeted him at sunrise on the mountain top resounds in the orchestral depths, the symbol of Nature, still mysterious, still inscrutable.

Even this brief synopsis suggests that "Zarathustra" is planned on a large scale. It presupposes an intellectual grasp of the subject on the composer's part. In its choice, in the selection and rejection of details and in outlining his scheme, Richard Strauss shows that he has thoroughly assimilated Nietzke. But, at a certain point, the musician in Richard Strauss asserts himself above the littérateur. "Thus Spake Zarathustra" was not intended for a preachment, save indirectly. From what occurs during that vain quest, from the last deep mysterious chord of the Nature theme, let the listener draw his own conclusion. In the last analysis, "Thus Spake Zarathustra" is not a philosophical treatise but a tone poem. In the last analysis, Richard Strauss is not a philosopher but a musician.

"A Hero's Life" is another work of large plan. Like "Zarathustra," it derives its importance as an art work from its eloquence as a musical composition. With a musical work, no matter how intellectual or dramatic its foundation, its test ever will be its value as pure music. Richard Wagner's theories would have fallen like a house of cards, had not his music been eloquent and beautiful. But as his music gained wonderfully in added eloquence and beauty by induction from its intellectual content, so does Strauss's. The fact is, music is music, while philosophies come and go. Yesterday it was Schopenhauer; to-day it is Nietzke; to-morrow it will be another. Doubtless, Wagner thought his "Ring" was Schopenhauer's "Negation of the Will to Live" set to music. Possibly, Richard Strauss thought Nietzke looked out between the bars of "Thus Spake Zarathustra." In point of fact, neither Wagner nor Richard Strauss incorporated their favorite philosophers in their music. Wagner may have derived his inspiration from his reading of Schopenhauer and Richard Strauss from Nietzke, for one mind inspires another. But the real result, both in Wagner and Strauss, was great music.

This is made clear by Strauss's latest tone poem, "A Hero's Life." Like "Zarathustra," it would be effective as music with-

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out a line of programmatic explanation. The latter simply adds to its effectiveness by giving it the further interest of "action" and ethical import. In "A Hero's Life" we hear (and *see*, if you like) the hero himself, his jealous adversaries, the woman whose love consoles him, the battle in which he wins his greatest worldly triumph, his mission of peace, the world's indifference and the final flight of his soul toward the Empyrean. All this is depicted musically with the greatest eloquence. The battlefield scene is a stupendous massing of orchestral forces. On the other hand, the amorous episode, entitled "The Hero's Helpmate," is impassioned and charming.

In the world's indifference to the hero's mission of peace, there is little doubt that Strauss was indulging in a retrospect of his own struggles for recognition. For here are heard numerous reminiscences of his earlier works—his tone poems "Don Juan," "Death and Transfiguration," "Macbeth," "Till Eulenspiegel's Merry Pranks," "Thus Spake Zarathustra"; "Don Quixote;" his music drama, "Guntram"; and his song, "Dream during Twilight." These reminiscences give "A Hero's Life" the same autobiographical interest that attaches to Wagner's "Meistersinger."

Strauss pays a tribute to Wagner in his latest work, the one-act opera, "*Feuersnot*" ("Fire Famine"). According to the old legend on which this *Sing-gedicht* (song-poem) is founded, a young maiden has offended her lover. But the lover being a magician, casts a spell over the town, causing the extinction of all fire, bringing cold and darkness upon the entire place, until the maiden relents and smiles again upon him, when the spell is lifted and the fires once more burn brightly. The young lover, Kunrad, in rebuking the people of the city, says:

> "In this house which to-day I destroy,
> Once lodged Richard the Master,
> Disgracefully did ye expel him
> In envy and baseness," etc., etc.

Accompanying these lines, Strauss introduces themes from Wagner's "Ring of the Nibelung." Undoubtedly "Richard, the Master," in the above lines, is Richard Wagner. When Mr. Paur saw Richard Strauss in Berlin last summer, the composer called his attention to the symphonic movement or tone poem which forms the climax of "*Feuersnot*," when the maiden and her lover

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are re-united and the fires burn brightly again, as a suitable fragment for a concert performance.

While Mr. Paur is not the first orchestral leader who has played Strauss's music in this country, he may justly be regarded as Strauss's prophet here. Not only do we owe to him the performances of "A Hero's Life," which definitely "created" Strauss here, but it was he who brought forward "Thus Spake Zarathustra," when he was conductor of the Boston Symphony Orchestra. As long ago as 1889, when Mr. Paur was conductor at Mannheim, he invited Strauss to direct his symphony in F minor there. Strauss accepted and also brought with him his just completed "Macbeth," asking to be allowed to try it over with the orchestra as he wanted to hear it—a request which was readily granted. Afterwards, at Mr. Paur's house, Strauss's piano quartette was played, with the composer himself at the piano and Mr. Paur at the violin. It is not surprising that when Mr. Paur came over here as the conductor of the Boston Symphony Orchestra, he championed Richard Strauss's work, and continued to do so after he became conductor of the New York Philharmonic Society.

Strauss has become such an important figure in the world of music that it is interesting to note what has been done to bring his work before the American public. Theodore Thomas, with the artistic liberality which he has always displayed toward every serious effort in music, produced Strauss's Symphony in F minor, which bears date 1883, as early as December 13th, 1884, with the New York Philharmonic Society. It was the first performance of this work anywhere. Strauss was not, however, heard again at the concerts of this organization until January, 1892, when Seidl brought out "Death and Transfiguration." Under Mr. Paur's leadership have been given the famous performances of "A Hero's Life" and selections from "Guntram" and the "*Feuersnot*" fragment.

Since he became conductor of the Chicago Orchestra, Mr. Thomas has given many performances of Richard Strauss's works—in 1895, the prelude to "Guntram," "Death and Transfiguration" and "Till Eulenspiegel's Merry Pranks"; in 1897, "Don Juan" and "Thus Spake Zarathustra"; in 1899, "Don Quixote" and the symphonic fantasia, "Italy"; in 1900, "A Hero's Life" (the first performance in this country) and the

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"Serenade" for wind instruments; in 1902, "Macbeth" (first performance in this country) and the "*Feuersnot*" fragment. Several of these works, besides those noted, had their first performance in this country by the Chicago Orchestra, and several have had repeated performances. "Eulenspiegel," for instance, has been given by the Chicago Orchestra as often as five times.

The Boston Symphony Orchestra also has a fine record as regards the performance of Richard Strauss's works. It has played the symphonic fantasia, "Italy" (1888), "Don Juan" (1891), Symphony in F minor (1893), Preludes to Acts I. and II. of "Guntram" (1895), "Eulenspiegel" (1896), "Death and Transfiguration" (1897), "Thus Spake Zarathustra" (1897) and "A Hero's Life" (1901). Nikisch, Paur, and Gericke are the conductors under whom these performances have been given. Several of the works have been played repeatedly not only in Boston, but in other cities where this famous orchestra gives concerts. Recitals of Richard Strauss's songs, which are among the most beautiful compositions of their kind, have been given in various cities by George Hamlin, a tenor singer, of Chicago.

As data regarding Strauss's life at the disposal of English readers are both scant and scattered, it may not be amiss to tell here something of his career. He was born on June 11th, 1864, in Munich, where his father, Franz Strauss, played the French horn in the Royal Orchestra, and was noted for his remarkable proficiency on the instrument. The elder Strauss has lived to watch with pride his son's growing fame and recently has celebrated his eightieth birthday. Richard began to play the piano when he was four years old. At the age of six he heard some children singing around a Christmas tree. "I can compose something like that," he said, and he produced unaided a three-part song. When he went to school, his mother by chance put covers of music paper on his books. As a result, he occupied much of his time composing on this paper, and during a French lesson sketched out the *scherzo* of a string quartette which has been published as his Opus 2. While he was still at school, he composed a symphony in D minor. This was played by the Royal Orchestra under Levi. When, in response to calls for the composer, Richard came out, some one in the audience asked: "What has that boy to do with the symphony?" "Oh, he's only the composer," was the reply. The year before (1880), the Royal

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Opera prima donna, Meysenheim, had publicly sung three of his songs.

During his advanced school years, his piano lessons continued, he received lessons in the violin, and went through a severe course in composition with the Royal Kapellmeister Meyer. In 1882, he attended the University of Munich. His "Serenade" for wind instruments, composed at this time, attracted the attention of Hans von Bülow, under whom he studied for a while at Raff's Conservatory in Frankfort. Bülow invited him to Meiningen as co-director of the orchestra, and when in November, 1885, Bülow resigned as conductor, Strauss became his successor, remaining there, however, only till April, 1886. His symphonic fantasia, "Italy," had its origin through a trip to Rome and Naples during this year. In August, 1886, he was appointed assistant conductor to Levi and Fischer at the Munich Opera, where he remained until July, 1889, when he became conductor at Weimar. In 1892, he almost died from an attack of pneumonia, and on his recovery took a long trip through Greece, Egypt and Sicily. It was on this tour that he wrote and composed "Guntram," which was brought out at Weimar in May, 1894. After the first performance, he announced his engagement to the singer of Freihild in "Guntram," Pauline de Ahna, the daughter of a Bavarian general. The same year he returned to Munich as conductor, remaining there until 1899, when he became one of the conductors at the Berlin Opera, which position he still holds. He is one of the "star" conductors of Europe, receiving invitations to conduct concerts in many cities, including Brussels, Moscow, Amsterdam, Barcelona, Madrid, London and Paris. He is a man of untiring industry. It is said that he worked less than half a year on "Thus Spake Zarathustra," and that the writing of his scores is a model of beauty.

At the age of thirty-eight, Strauss occupies a commanding position in the world of music. He has achieved it through a remarkable combination of musical technique and inspiration coupled with rare industry. His ideals are of the highest. His intellectual activity is great. He seems a man of calm and noble poise, of broad horizon. It would be presumption to speak of "expectations" as to one who has accomplished so much. For the great achievements already to his credit are the best promise for the future.

GUSTAV KOBBÉ.

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AMERICAN CONTROL OF ENGLAND'S FOOD SUPPLY.

BY J. D. WHELPLEY.

MR. CARNEGIE recently expressed the opinion that no power could long wage war against the United States, because the United States controls the food supply of the world. This statement may be considered as somewhat too sweeping, for an undoubted exception would be Russia, which is a food-exporting country. France and Germany, while heavy importers of food stuffs, also possess great agricultural resources, which, in an emergency, would develop corresponding power of resistance to famine. As applied to England, however, Mr. Carnegie's statement is absolutely true. If the United States were suddenly to stop all present regular exportations of meat and breadstuffs to the United Kingdom, the first effect would be an enormous rise in prices throughout Europe, and it would be but a few weeks before the English people would be threatened by dire famine, with no possible relief in sight so long as commercial relations with the United States were suspended. This is not a matter of conjecture. It is susceptible of mathematical demonstration.

England's total importations amount annually to over two billion dollars in value. Of this vast aggregate, nearly forty per cent., or about 900 million dollars, is food for the people of the United Kingdom. Meat and other animal products are purchased to the amount of 600 million dollars, and breadstuffs and other vegetable food products to the amount of 300 million dollars. Of the total importation of food staples by the United Kingdom, the United States furnishes about 540 million dollars, or sixty per cent. Of the great national meat bill, twenty-seven per cent., or about 160 million dollars, is paid to the United States; and of the trade in breadstuffs, this country receives about 150 mill-

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ion dollars, or over fifty per cent. These figures are startling in their magnitude; but their full significance is realized only when the conditions which govern the distribution of the food supply of the English people are fully understood.

The British statisticians inform us that the average citizen of the United Kingdom, ten years ago, consumed annually 120 pounds of meat, and that his consumption now is 132 pounds. Ten years ago, he produced eighty-one pounds of this supply and imported thirty-nine pounds. Now he produces but seventy-eight pounds and imports fifty-four pounds. In brief, the English citizen has largely increased the portion of meat required for his annual ration, and at the same time has become more dependent upon foreigners for the supply.

From the same source we learn that, ten years ago, an average citizen of the United Kingdom consumed annually 362 pounds of wheat. Of this he grew 88 pounds, and he bought 274 pounds abroad. At the present time, this same consumer is using about 338 pounds of wheat, of which he grows 77 pounds and imports 261 pounds. The decrease in the percentage consumption of wheat is said to be due to the greater variety in the component parts of the ration, other vegetable foods having taken its place. The amount produced at home, however, has decreased in greater ratio than the amount imported; hence the statement holds good, that the people of the United Kingdom produce less bread and meat *per capita* than ever before, notwithstanding the increased demand of a larger and better-fed population. If it were true that the home production and the imports were distributed evenly throughout the United Kingdom, so that every individual actually bore his or her *per capita* share of each, the effects of a sudden stoppage of a large percentage of the imports could be endured with more or less equanimity for a considerable time, and with the minimum disturbance to the economics of the country as a whole. This condition does not prevail anywhere, however, and to a marked degree it is not the case in the United Kingdom.

The British country dweller lives almost entirely upon what he or his neighbors produce from British soil. Well-to-do suburbanites and those of comfortable incomes in cities consume British products by preference, for reasons of taste, custom and local pride. The bulk of the population in large cities live almost

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entirely upon imported breadstuffs and meats; and upon these people would fall the burden of any war which resulted in hampering trade with the granaries and the slaughter-houses of the export trade of the world. Nearly one-fifth of the entire population of the United Kingdom is centred in and about London. We need make but a superficial examination of the great markets of that city to become thoroughly satisfied as to the important relation held by the United States to the household economies of the British people. American bread and meat constitute the bulk of the supply of those staples; and the only serious competition the American purveyor encounters in most lines of the trade in food stuffs is from his own countrymen.

The significance of the fact that the congested centres of population are dependent upon foreign food supply, cannot be overestimated in considering the strategy of the situation. It is there the shortage would be felt first and almost immediately. Thence would come the cry for food; there would spring up the panic and the bread riot. The war party in power would find itself embroiled in a controversy between patriotism and hunger. There can be little question as to which would prevail, for the hunger would continually increase. There would be no relief but through compromise with offended national pride.

For many years, thoughtful British statesmen have recognized the possible disastrous consequences of a war with the food-exporting nations. There has been talk of great warehouses, in which the Government should store grain enough to last through a siege of several months' duration. Nothing has been done in this direction, however; and the country lives from hand to mouth, a few days' delay in the arrival of expected shipments of breadstuffs or meat sending the prices skyward in the home markets. It has undoubtedly been reasoned by British Government officials that, with the greatest navy in the world at their disposal, supplies could be safely conveyed to the people at home from any foreign ports, no matter which country might be belligerent. It was probably never realized that the recalcitrant American colonies of one hundred years ago would in time absorb a majority of the food-stuff trade of the world, and by virtue of this fact, if no other, hold the balance of power among the peoples who to live must eat of civilized provender.

Looking back upon the history of England and her colonies, to

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find, if possible, some neglected avenue of escape from the startling dependence of the mother country upon strangers and aliens, we discover that the children have been left to shift for themselves. They have been given a flag and allowed autonomous government, but no concessions have been made to the products of their soil. They have been forced to develop their own resources, to find their own markets and to compete on equal terms with foreigners for the trade of their natural market at home. Some of these children have adopted a policy of protection through import duties, and have even given heavy preferential rates to English goods for no other reason, apparently, than that of kinship. Canada is one of these. Her concessions were made freely, in the hope that in return she might possibly secure a larger share of English patronage.

When Canada joined with the other self-governing colonies and asked England to establish a five per cent. preferential in favor of colonial products, the rulers of England refused to give the matter serious consideration. Australia, with her vast grazing grounds, could have produced a large proportion of the meat needed by the United Kingdom; and Canada, with her great grain areas, could have undoubtedly produced the bulk of the breadstuffs, had England had the forethought, a quarter of a century ago, to give momentum to the development and growth of her dependencies, by buying what they had to sell before she turned elsewhere. It is too late now to do much in that direction. Australia sells the English people mutton, frozen and canned. Canada trails in upon the British market with a portion of her surplus; but the American meat-packer and the American grain-dealer have secured the great bulk of the trade, and have developed the supply at the ratio necessary to keep pace with the demand. Should England now decide to favor her colonial products by preferential tariffs, it would be at such a cost to the consumers of the United Kingdom that no political party would dare stand responsible for the measure.

A more detailed examination of England's food importations will but serve to emphasize her absolute dependence upon the United States for her daily bread. In treating of the grand totals, the percentages furnished by the United States are startling; but, in dealing with some of the single items upon which great communities in England are almost entirely dependent for

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food, the percentage furnished by the United States is even sensational. The percentage of the grand total is reduced by being made the average of many articles of trade. Some of these articles, which go to England largely from nearby countries of Europe, do not cut much of a figure in the food bill of the poorer classes. The hordes of people who populate the densely crowded sections of London care not whether fine butter comes from Denmark or the United States, or whether it comes at all; but if the penny loaf of bread should rise to a sixpence, or the scraggy bit of meat to which they are accustomed should no longer be obtainable, then things would happen in London which have been hinted at in the past and dreaded for the future. If that metropolis of all the world should ever disgorge a bread-hungry mob, it will be as though the denizens of the jungle had been let in.

The people of the United States might well hesitate, in some future crisis, before they made these things possible, even should England's rulers ever be so blind and desperate as to ignore them. The American people, by their control of the English food supply, hold in leash the furies of famine, riot and disaster, which wait but the opportunity to spring at the throat of a country hopelessly weak at her base of supplies. In event of controversy with England, it would be incumbent upon the United States in the cause of humanity to forbear to the utmost, for, once war was declared, there could be no mercy. While the great armed fleets of the present Mistress of the Seas were threatening bombardment of American cities, the lack of American bread and meat at home would soon avail to turn their prows away from American shores. Foreign manufactures can be shut out of a country and the nation still live, but the people cannot live without food.

To no other country could England turn to make good the deficiency. All western Europe is an importer of food stuffs. The surplus of Russia is now exhausted before it reaches the United Kingdom; and, should the European supply be decreased by interference with the commerce of the United States, there would be a dangerous deficiency in the supply of nearly every large country of the Old World. The necessity of providing for the people of the European continent would not only send prices up, but would prevent England from securing even the small amount she now gets from that direction. A blockade of Amer-

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ican ports, whether brought about by the armed force of an enemy or by a decree of the people of the United States themselves, would so disorganize and unbalance the trade of the whole world as to bring about a food panic, which, while felt most acutely in England, would bring disaster to many other countries as well.

Mr. Frank H. Hitchcock, Chief of the Bureau of Foreign Markets in the Department of Agriculture, has been engaged for some time in securing data as to the percentage of the food stuffs imported into the United Kingdom which were furnished by the United States. Mr. Hitchcock's figures are recent, accurate, and compiled with great care and labor. They present an even more remarkable condition of affairs than is conveyed to the mind by any statement dealing merely with totals. While it is true that the United States furnishes only twenty-seven per cent. of the total value of the meat and other animal products imported by the United Kingdom, the actual percentage of the bulk of the staples upon which the people depend for food from day to day is very much greater. The following table shows within a fraction of one per cent. the strength of the United States in the English markets in the principal items of animal food:

Articles.	Total Imports of the United Kingdom.	Percentage Furnished by the U. S.
Cattle, live	495,645 head	71
Sheep, live	382,833 head	38
Beef, fresh	462,350,560 lbs.	70
Beef, salt	21,608,608 lbs.	96
Beef, cured	58,019,248 lbs.	56
Bacon	631,818,656 lbs.	89
Hams	201,899,040 lbs.	89
Lard	215,854,688 lbs.	93
Pork, fresh	77,884,240 lbs.	35
Pork, salt	27,857,536 lbs.	52

All the percentages furnished by the United States of the above-mentioned articles of food are greatly in excess of the twenty-seven per cent. of the grand total. The articles in which the American trade lags are, mutton, which comes largely from Australia, and dairy products, which are largely furnished by Denmark, Canada, and the Netherlands. The weak points in the American trade in the principal items are shown as follows:

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Articles.	Total Imports of the United Kingdom.	Percentage Furnished by the U. S.
Mutton, fresh	379,999,000 lbs.	0.09
Mutton, cured	7,219,744 lbs.	4
Tallow	243,934,992 lbs.	26
Oleomargarine	103,086,144 lbs.	0.07
Butter	378,393,792 lbs.	2
Cheese	303,058,336 lbs.	25
Milk, condensed	10,544,336 lbs.	4
Milk, other	1,751,456 lbs.	0.01
Eggs	168,820,780 doz.	3

It will be noted that, with the exception of mutton, practically all of the items in which the United States has a small percentage of the trade could be entirely dispensed with in England without actually starving the people into submission; but the items which are furnished by the United States in the largest proportion are those which are absolutely necessary to a continuance of life. The estimate of twenty-seven per cent. as the amount of the imported animal foods furnished by the United States is based upon values, and this accounts for the fact that it is not as large as might be expected after examining the figures of the meat importations. The dairy products run into money much faster than the meat products, and add largely to the total values. These dairy products, being furnished from western Europe, offset in value the amount of food sold to the United Kingdom by the United States, but the aggregate of their value is very much less significant than the aggregate values of the meat products. The enormous amount of mutton furnished by Australia is the only feature of the vital supply which is not controlled by the United States; but beef and pork are consumed in such greater quantities that the item of mutton, though large, does not save England from her absolute and startling dependence upon foreigners for her meat supplies.

The principal grains imported for food are, wheat, of which the United States furnishes forty-seven per cent.; wheat flour, of which the United States furnishes eighty-three per cent.; and oatmeal, of which the United States furnishes eighty-five per cent. All of these percentages are much higher than that of the grand total, which, as stated, is fifty-three per cent. This total percentage is influenced, in figuring the total values, by the large amount of sago imported, practically all of which comes from India, and also by the fact that some grains are included

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among the breadstuffs which are not all used for food. Oats is a notable example. Of this, the United States furnishes but twenty-eight per cent., the balance coming from Russia. If the English food situation were considered solely in relation to the amount of actual meat and flour consumed, the United States would be shown to be unquestionably in absolute control of the supply, for these, after all, are the products really at issue.

In thirty years, Great Britain has decreased the amount of land under the plough from about eighteen million acres to about fifteen million acres, three million acres having been added to the area of permanent pasture. The area devoted to the growing of breadstuffs has decreased correspondingly; and, owing to greater pasture room, the number of cattle has slightly increased during the past thirty years, although there has recently been a sharp decline in the visible supply, amounting to about fifty thousand head during the past twelve months. In the matter of sheep, however, there has been a loss of two and one-half per cent., which, considering the widespread use of mutton in the United Kingdom, is an indication of the increasing cost of food for live stock and the success of foreign competitors. Australia is crowding the sheep industry of the mother country to the wall. During the past year, the United Kingdom lost sixteen thousand head of horses, fifty thousand head of cattle and 647 thousand head of sheep from the visible supply of live stock. In no direction at home or in the colonies is any effort being made by England to increase her food resources, or to secure to herself any preference in the distribution of the existing supply.

It has been suggested by practical American cattlemen who have personally investigated the matter, that the United Kingdom possessed an opportunity to largely increase the home supply of meat, by converting her pasture lands into great feeding grounds for young and lean cattle brought from abroad. In ordinary times, food for cattle can be imported at prices not so much greater than prevail in the producing areas. By bringing young cattle and the class of live stock known in the United States as "feeders" to the English pastures, and there finishing them for market by putting on the weight which now brings such good prices in the English markets, a British farmer could find an excellent outlet for his energies and a profitable use for his plant. Even here, however, the British Government steps in and makes

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this plan impossible by requiring that all imported cattle should be slaughtered within a few days after their arrival on British soil. This is done for alleged sanitary reasons, and in response to a demand for so-called protection to British-grown live stock. The course of reasoning from which this results is not entirely clear to an American, to whom the opportunity seems so apparent, the local need being unquestionably great. This plan has all the more value in that the *per capita* supply of live stock is decreasing throughout the world, and a permanently higher level for meat prices has been universally predicted.

The *per capita* exports of the United States are $18.81, and the *per capita* imports $10.58. The *per capita* exports of the United Kingdom are $31.54, and the *per capita* imports $58.03. These figures form the basis for the time-worn controversy over the so called "balance of trade," its real meaning, its significance, and its value as an indication of the industrial condition of a country. In considering the food supply it is sufficient to state, however, that a large proportion of the exports from the United States consists of bread and meat, while comparatively none is imported. In the case of the United Kingdom, a large proportion of the imports is bread and meat, and comparatively none of the exports. In these facts lies the gist of the situation, so far as the food resources of both countries are concerned. England's exports could be refused by a belligerent without serious damage, except to the exporting country; whereas the exports of the United States must find their way to the foreign consumer or the latter starves.

With a suspension of trade relations between the United States and the United Kingdom would come disaster to the latter country, other than that resulting from a shortage of food. England buys annually nearly 18 hundred million pounds of raw cotton. About 150 million pounds of this comes from the United States. A stoppage of these shipments would close down the mills, throwing thousands of operators out of work, and bringing about all the evils usually resulting from such an industrial situation. Leather, lumber, iron, steel, oil, and a number of other important staples of commerce are also secured largely from the United States; and a cessation of shipments of these articles would not only inconvenience those in the habit of using them, but would have immediate and disastrous effect upon many trades and in-

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dustries. Even with trade unhampered, a distinct rise in prices of all foods and of the great items of supply from abroad has been a feature of the English markets during the past year. A threat of war would send these prices to such a point as to cause distress and disaster. War itself against the United States, the English base of supplies, could only result in speedy capitulation or inevitable ruin.

Many interesting and important deductions might be made by the people of the United States from this striking situation. In this brief and very general survey of the situation, England has been the only country considered. In a more or less direct manner every one of the Powers, with the possible exception of Russia, is dependent upon the United States in the matter of food supply. If not large importers, they are deeply concerned with the welfare of the consumers; and the avalanche of food staples poured into the markets of the world by the United States keeps a wholesome, strengthening and economical diet within the reach of the masses of people everywhere. Yet this avalanche is not so great, under normal conditions, as to deprive the producers of all profit.

Americans are apt to refer rather disparagingly to the United States as a raw-material producing country, and to note with pride and satisfaction the increasing percentage of manufactured goods in the total exports. It is evident, however, that the strong grasp of this country upon the affairs of the world is due largely to these raw-material exports, and not so much to the manufactured goods. The latter enter into competition with the labor of countries whose entire energies are concentrated upon similar production, but which cannot produce enough food to keep their industrial population alive. To expand and strengthen in every way the productive power of American soil, to encourage the building of homes upon the agricultural lands, to prevent the absorption of those lands by those whose purpose is other than that of tillage, is manifestly a wise national policy. To enable production to keep pace with the growing appetite of the world, and to prevent the United States from losing its control of the great food supply necessary to satisfy this appetite, is even a more statesmanlike policy than to devote all time and energy to the building of great cities and the creation of industrial armies to be fed from abroad, to be perhaps dependent at intervals upon an enemy for daily bread.

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Mr. Carnegie said: "It is indeed a great matter for this country to feed the whole world, as it will soon be doing. It renders us unassailable. No power can take a step against us, even should it declare war. Let our exports of food stuffs be reduced by only ten per cent., and prices in Europe would double; while reduce them fifty per cent., and the starving people of the nation that had made war with the United States would quickly force peace upon their Government."

With his wide comprehension of the industrial forces at work in the world, Mr. Carnegie has thus briefly indicated a condition which will do more for international peace than all the treaties which could be negotiated. Treaties and alliances can be set aside, but the people of all nations must eat to live. By virtue of her great agricultural possibilities, realized upon through the industry and enterprise of her people, the United States is the food purveyor for the world. In this simple fact lies greater strategic strength than in formidable armies and navies.

J. D. WHELPLEY.

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DEFECTS AND ABUSES IN OUR POSTAL SYSTEM—I.

BY HENRY A. CASTLE, AUDITOR FOR THE POST-OFFICE DEPARTMENT.

ALL public men and patriotic citizens should know more about the postal service, take a more lively interest in it, watch its development carefully, and guard its integrity with jealous zeal. It is an exceedingly vital part of our government polity—all the more vital because it is, strictly speaking, not a public function at all, but is more properly a private or corporate enterprise engrafted on the government's mechanism, under pressure of an imperious necessity.

The "general welfare" clause of our Constitution has permitted many useful undertakings in the line of national paternalism. We stamp the people's coin and we print their bills. We have the life-saving service; the light-house system; the marine hospital corps, to protect people's lives and health; a signal service, to warn them of coming changes in the weather; a fish commission, to preserve our sea-food from extinction. For the diffusion of popular information in various channels—almost purely educational work—we have the vast Agricultural Department, the bureaus of Ethnology, Geological Survey, Statistics, Coast and Geodetic Survey, the Naval Observatory, the Smithsonian Institution and its museum, the Congressional Library, the Botanical Gardens, and other institutes of applied science, each with its learned faculty and its munificent outlay. The annual expenditures for all these educational enterprises, if capitalized, would form an endowment aggregating hundreds of millions of dollars.

These provisions for the protection and enlightenment of the people are all gratuitous. They are paid for by general taxation,

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and no one would dream of exacting remuneration for their benefits, or securing from them any appreciable revenue.

But that other educational enterprise, grander and vaster than any or all of them, the United States Postal Service, stands solitary and conspicuous on a basis of its own. It has receipts as well as disbursements, earnings almost equal to its expenditures; and it alone, organized after the manner of an individual or corporate business, brings into the governmental problem an equation that well merits both philosophical analysis and most solicitous practical consideration. It was a political after-thought in our national scheme, not recognized in the beginning as one of the great departments, its head not called into cabinet councils, its operations little considered among the important features of statecraft and financiering.

It long ago leaped to unchallenged primacy. In volume of financial transactions, diversity of ramifications and number of employees, the Post-Office Department surpasses all the others combined. Aside from its regular operations, it furnishes through its money-order division a national bank of issue and deposit, used by thousands who fear to trust any other custodian of their treasured earnings, and doing a larger business in foreign and domestic exchange than all competitors.

Accomplished results have royally justified its establishment and maintenance. It has been a potent instrument of advancing civilization. Incredible as its advancement has been, marvellous as its efficiency now is, there are still opportunities for improvement within its legitimate sphere.

Publicists and philanthropists may properly stimulate an enlightened public opinion, that shall cordially sustain efforts for betterment along lines of recognized propriety, and as resolutely discourage wild excursions into boundless fields of adventure lying beyond the boundaries of needful prudence and common sense. This sustaining and restraining public opinion can only be effectively promoted by directing attention both to the beneficent achievements of the American postal system, and to its inherent defects, the manifest abuses to which it is subject and the evils, curable and incurable, incident to its colossal proportions and enormous growth.

Its benefits and achievements need little exploitation. They speak, trumpet-tongued, from each of its innumerable instru-

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mentalities, as they come into daily, hourly touch with the industrial activities and domestic life of our entire population. A few of its defects are equally palpable, complacently recognized and amiably regretted. Most of them, and those by far the most serious, are obscure or hidden, revealed in their worst form only to close observers or practical adepts in postal affairs.

In the March and April numbers of this REVIEW, last year, the writer presented some considerations relating to the perils involved in proposed extensions of the postal function, that would enfold telegraphs, savings-banks, and other enterprises within its already too-capacious embrace. The wide attention given to those suggestions and the valuable discussions they stimulated, have disclosed a prevalent desire for fuller information as to minor, but nevertheless pregnant, details of the operations connected with this greatest of modern (or ancient) incursions into the domains of state socialism.

As has been intimated, the most noteworthy characteristics of the United States mail service have been its tremendous extension and expansion. The entire list of post-offices in 1790, seventy-five in all, contained none located west of Winchester, Virginia; the Auditor's report for 1901 enumerates sixty-six offices in Alaska, ninety in Hawaii, and seventy-five in Porto Rico,—all as fully naturalized and incorporated and domesticated as any of their 76,000 colleagues within the limits of the old "Union as it was" four short years ago!

The annual mileage of mail-transportation by railroads in 1875 was 75,154,910 miles; in 1901, it was 302,613,325 miles. There have been no important changes in rates of postage since 1885, but the revenues of the Department, which were seventy-five cents *per capita* in that year, had risen to $1.03 in 1891, and to $1.44 in 1901.

While the aggregate financial transactions of the Department in 1790 were $130,000, for the current fiscal year they will reach $900,000,000, and next year a round billion. Whereas, even as late as 1860, the sole function of the service was slowly, painfully, and not very carefully to convey letters, papers, and small packages from one office to another for leisurely delivery at the windows thereof, we already have railway mail distribution, money orders, carriers for city and country, registry, special delivery messengers, pneumatic tubes, postal cards, stamp books,

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cancelling machines, Bundy clocks, street boxes, and other extensions, amplifications and devices to accelerate the work.

It is too much to expect that this unprecedented increment—little of it the result of logical growth, but most of it due to the hasty engraftment of popular excrescences—could be accomplished without developing numerous faults and blemishes, often slow to be discerned, and always hard to be eradicated. Some of them are inherent in the system, inevitable, incurable, only to be minimized, in the danger or actual injury they involve, by sleepless vigilance and inflexible honesty of administration. Others are unnecessary, avoidable, inexcusable, yet so firmly entrenched that they live through decades and generations, ebbing and flowing from feebleness to vigor and back again.

This inquiry relates especially to what are deemed the unnecessary evils and defects of the postal service, avoidable and curable through executive action or legislative enactment.

Our ubiquitous, long-enduring national government is now collecting, transmitting, and delivering at the doors of remote farm-houses, as well as of city residences, various classes of mail matter at prices substantially uniform for all distances or circumstances, which may be roughly stated in the following terms: Letter mail at two cents per ounce (practically more than four cents per ounce, since single-rate letters average less than half an ounce each in weight) yields a large profit. Merchandise mail at one cent per ounce, postal cards and circulars at one cent each, yield a smaller but sufficient margin. Books and printed matter at one-half cent per ounce barely pay the cost of transportation and delivery. Transient papers and periodicals at one-fourth cent per ounce cause a loss, but the loss is not large in the aggregate, because the volume of the business is relatively insignificant. Second-class mail—that is to say, newspapers and periodicals mailed by the publishers at the office of publication—paying one cent per pound involves a very heavy loss, unquestionably aggregating many millions of dollars a year.

Investigation has shown that the service costs, on an average, eight cents per pound for all classes of mail; hence, matter paying a lower rate is carried at a loss to the postal revenues, and at a corresponding profit to the patrons who furnish it. Conversely, the patrons who send the profitable mail contribute precisely the amount of the profit for the benefit of those whose mail is carried

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at a loss. An inevitable struggle arises between those who seek to moderate the inequalities, on the one hand, and those who seek to retain lucrative advantages, on the other.

The rate of one cent a pound, justified only by the educational feature of the service, was intended solely for newspapers and other periodicals devoted to the dissemination of news or public intelligence. Enormous use has been made of this exceptional privilege for sending novels, "serial" literary works, advertising sheets and nondescript publications issued only for private emolument, having no public function and none of the characteristics of a genuine periodical. The mails are overloaded with this illegitimate matter, to the extent of one-fourth its entire bulk and weight; but it pays only one-fifty-sixth of the revenue. Postmaster-General Smith estimated the actual loss last year on this service at $12,340,612. It is a gross and manifest abuse that limited groups of private interests, using the mails solely for personal ends, with no public object or benefit in view, should succeed in eluding the plain purpose of the law, and carry on their illicit transactions at the expense of others.

Heroic efforts are being made to remedy this evil, but private interests which would be adversely affected by the success of these efforts will fight to the bitter end, in the Department, in the courts and in Congress, to prevent the abrogation of their vested right to raid the Treasury. Congress should sustain the Department and not thwart it in this righteous crusade. When private firms or corporations can send through the mails at pound rates the trashiest of literature, and when manufacturing chemists can circulate their advertising sheets everywhere under the guise of legitimate publications, the time for reform has come.

There is a characteristic anomaly connected with the delivery of second-class mail-matter in cities, which often excites public speculation. The law excludes a publication from the benefit of second-class rates in its own city, in order that the mails may be saved the necessity of delivering daily newspapers to their patrons. A daily paper or a monthly magazine can now be sent, for instance, from Boston to New Orleans, and delivered by carrier at the residence of a subscriber in the remotest suburb, for the ridiculously inadequate fee of one cent per pound. But if it is mailed from the office of publication to a subscriber in Boston, a two-cent stamp must be affixed on it, or a one-cent stamp if it

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weighs less than two ounces. The necessity for this provision impressed itself upon the authorities at an early date, and the principle of practical prohibition of second-class mail delivery has been consistently maintained from the beginning, although subject to the periodical assaults of interests adversely affected thereby. It is, probably, not conceivable that any of the great dailies of our leading cities would unload the delivery of their entire local edition on the postal service if this barrier were removed. But they would have the legal right to do so, and the only method of preventing that action is the wholly illogical enactment referred to.

All the avoidable abuses are not actually existent. Many are only in embryo, but with well-matured aspirations, already menacing. The irrepressible enthusiast who declaims against government by injunction is loudest in advocating further innovations that would soon lead to government in the hands of a receiver. There is loud and influential demand for the postal telegraph, postal savings-bank, and a postal life-insurance bureau. There are wild, vague cries for the absorption of all railways under government ownership and Post-Office Department management.

It may be true that the government could send out telegrams at reduced rates and pay expenses; but little, compact England has lost $3,500,000 a year trying to do it, and is very weary of the experiment. It may be that we could pay three per cent. interest on savings deposits, fund them in two-per-cent. bonds at a premium, and earn profits after paying an army of employees to keep the accounts; but it is hard to convince an unbiased intellect that this is feasible.

Some problems would be solved and certain inconveniences minimized if Uncle Sam would undertake to grind wheat into flour, or saw logs into lumber, and sell the products below cost; it would manifestly be pleasant, for a time at least, to live in a nation which would protect us against losses by bad investments, guarantee liberal returns from all enterprises, and regularly pay fat dividends to all citizens.

An influential *clientèle* now clamors for the parcels-post. These desire to have the limit of weight on packages of merchandise transmissible through the mails extended from four pounds, as at present, to eleven pounds or more. It is further proposed to establish a rate on such packages of six cents for

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the first pound, and two cents for each additional pound up to eleven; thus eleven pounds would cost twenty-six cents from New York to Seattle, Honolulu, or Manila, or just sixty-two cents less than experience shows is the actual cost of service for average distances. National associations of commercial men have passed strong resolutions favoring this innovation, and other resolutions demanding the negotiation of additional postal treaties with other nations. Great emphasis is placed upon the advantage to be derived from these measures by consumers, who are urged to cooperate in seeking by this indirect means to reduce the charges of railroads and express companies.

It is argued that this concession would greatly increase business and accommodate the people. No account is taken of the loss that would necessarily result to the postal revenues, that being a consideration of little weight with those who would greatly profit by this new departure.

On the other hand, retail merchants' associations in different sections energetically protest against the scheme. They warn retailers that their business may receive a most serious blow, unless they bring to bear on national law-makers the pressure necessary to defeat such legislation. They demonstrate that this system would permit mail-order houses in the larger cities ultimately to control the retail business of the entire country, the expense of carrying merchandise for these establishments, at a cost much in excess of the postage received, being paid for by public taxation.

The controversy thus going on between conflicting interests, one seeking advantage, and the other fearing injury from an innovation in postal methods, shows how distinctively the postal service is a part of the business machinery of the country, and how susceptible it is to abuse from unconsidered legislation for the special behoof of those who originate and promote it. It is difficult to see what argument can be adduced in favor of carrying parcels of merchandise at rates far below the cost of such carriage, that will not equally apply to conducting our entire transportation or manufacturing business by the general government for the benefit of favored classes of its citizens. It is the belief of thinking persons that the use of the mails for transporting merchandise goes far enough under existing laws. A further extension will involve serious loss, and work an injury to the service as well as an injustice to those who make up the deficit.

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The inequalities of the present system are made more glaring by an inspection of our parcels-post treaties. The existence of those treaties is a menace to the postal service, and affords occasion for insisting on more generous domestic concessions in the same line. We now have treaties with Germany, Mexico, and several of the republics of Central and South America, whose provisions involve the curious anomaly that we can send eleven-pound parcels by mail to these countries, and their people can send such parcels to us, while we, in the United States, cannot send parcels of more than four pounds weight by mail to one another. And a package less than four pounds in weight can be sent, under these treaties, from the interior of America to the interior of Germany at a less rate of postage than would be charged from one city to another in the United States. There is merit in the suggestion that one or the other of these conditions is wrong. The arrangements with foreign countries have been entered into by the executive under the treaty-making power, and, possibly, without due consideration of their inconsistency with our own methods. But to extend this abuse by treaty with all other countries, and to domesticate it in our own, as is strongly advocated by many persons directly interested in doing so, would be a stretch of paternalism never dreamed of by the founders of our postal service. It is probable that we have blundered in reciprocating the parcels-post system of foreign countries, and that it would be better to revoke those treaties than to open all our mails to the eleven-pound package at proposed rates of postage.

The contemplation of the success which various private enterprises have achieved in securing benefits from having postal rates adjusted to suit their convenience, has inspired a demand on the part of patrons of letter mail for a reduction of letter postage to the uniform rate of one cent per ounce. The argument made in favor of this reduction is a strong one. That class of mail pays the profits which render the present service possible.

No one clamorously demands the reduction, however, except firms and corporations which annually expend amounts ranging from hundreds to thousands of dollars each on their letter mail. These naturally feel that, if they could reduce that disbursement one-half, they would effect a material saving, and they do not understand why they should contribute that money to help carry other losing elements of the service.

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Their demand has been organized by promoters, who have contracts providing for the payment to them of a proportion of the savings that would result from the reduction. There does not seem to be any immediate prospect of the success of this proposition. Its adoption would result in an immediate loss of at least $30,000,000 a year to the postal revenues, entailing a deficit which the general public would not consent to. Those who demand it have little care for public interests, and they forget that the service would be fatally crippled by this wholesale reduction of revenues without any compensating advantage or increase of business. The bulk of the letter mail would undoubtedly increase after lower postage was inaugurated, but all the elements entering into the expense of handling it would increase in equal ratio, with the single exception of the cost of transportation by rail. More clerks, carriers, route agents, inspectors, more bags, satchels, locks, and keys, would be required, as the number of letters multiplied. But the multiplication would be slow; years would elapse before the lost revenue would be regained.

It is argued that the saving on second-class matter to be effected by reforms recently inaugurated, will compensate for the loss of revenue by reason of reduced letter postage. But that saving is still in abeyance, and is a purely speculative benefit to be realized, if at all, in the distant future. If the publishers who are ruled out of second-class privileges withdraw their thousands of tons of books, etc., and forward them by express, the weight of mails transmitted will necessarily be reduced. But as the mails are weighed only once in four years, in alternating sections of the Union, the full effect of any reduced burden of second-class matter will only be felt at the end of a quadrennial period.

During this interim, the regular increase in circulation of newspapers, periodicals, etc., still going forward at one cent a pound, will partially neutralize the expected gain, and possible modifications of the present stringent rules, made either by executive or Congressional action, may be expected to complicate the situation still farther. In other words, we cannot depend on any such gain to the revenues or reduction in expenditures in the near future, by reason of the sweeping reforms in second-class abuses now being attempted, as would compensate for the reduction of letter-postage by fifty per cent. No official prominently connected with the system expects an early realization of the "one-cent"

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rate; few persons ask for it, except those who have a large pecuniary stake involved.

Theoretically, there is an admitted injustice in requiring the patrons of the letter mail to make good a deficiency caused by favoritism to other interests. But, practically, as above demonstrated, they must endure the burden until relieved by the correction of other abuses. To lift it from them now would entail a shock fatal to the efficiency of the whole service.

The leading defect and abuse of the service under present conditions are found by many investigators in the excessive amount paid to railroads for carrying the mails. Exhaustive reports have been made to Congress by committees and commissions on this subject, some of them claiming that the principal cause of the deficiency in the revenues is the cost of transportation by railroad companies, under existing laws. One report says that, whereas we pay on an average eight cents a pound for this service, the best estimate to be made from the proofs at hearings before the committee is that the actual expense to the transportation companies is about one cent per pound, and that express companies, which are said to pay about forty per cent. of their earnings to railroads for hauling their cars, underbid the government on second-class mail matter, carrying it at less than one cent a pound on hauls of less than five hundred miles, and still make a profit.

The "Statistical Abstract" published by the Treasury Department contains a table giving, among other things, the average cost per mile of railroad mail transportation, for a long series of years. According to this table, the average annual cost per mile was less than ten and a half cents in 1878, and 12.73 cents in 1901 —and this in face of the fact that all other railroad charges have been greatly reduced. Reports of Congressional committees allege that, since the last reduction in rates of mail transportation in 1878, railroad freights have decreased thirty-five per cent. and passenger fares seventeen per cent.; and that, if the Department could have legally required a reduction of even twenty-five per cent., the saving would now be more than $9,000,000 a year. Of course, these statements are controverted by representatives of the railroads, but there is enough merit in the contention that the railroads are grossly overpaid to explain the agitation for a readjustment of compensation on equitable terms. Every effort,

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however, is met and thwarted by an energetic lobby, which watches over the interests of the corporations with sleepless vigilance.

Many citizens find a possible menace to the ultimate integrity of our postal affairs in the organizations which have been formed among the various classes of its employees, avowedly for the advancement of their own interests, as well as for the public benefit. Unquestionably, the merit system, as now applied in our national Civil Service, is absolutely indispensable to the efficient working of our governmental machinery, and nowhere are its benefits more visible and pronounced than among the vast army of employees under the jurisdiction of the Post-Office Department. Very little of the present marvellous speed and accuracy of our mail service would be possible if the old practice of appointing and removing carriers, clerks, route agents, etc., for purely political reasons, still prevailed. Certainly, more than double the number now employed in all branches would be required, if their positions were again made dependent on the will of Congressmen or political committees, as was formerly the case.

But the independence and permanence of their present tenure have a peculiar effect in encouraging the formation of associations of the various classes for mutual benefit. Formerly, the clerks and carriers of a city post-office were under obligations to their Congressman, as they were his appointees and the creatures of his will. The tables are turned; clerks and carriers, organized into effective societies, seem to feel that the Congressman is of their creation and subject to their dictation, or, at least, to very strong pressure in the direction their interests lead. Every branch of the service has its local and national organization, each persistently working for an increase of pay. The president of the National Letter-Carriers' Association recently said:

"Fortunately, this organization is not a body created merely to secure legislation, but is fraternal and protective as well. Men band together for mutual protection. It was this coming together of people for the purpose of protecting themselves against the encroachments upon their rights and liberties that gave us this country of ours. It is for the purpose of protecting themselves, and, at the same time, to better serve the public, that this National Letter-Carriers' Association was called into existence."

The desire to serve the public better is a laudable one; but, if we accept the general spirit of this proclamation, we shall un-

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questionably be impressed with the idea that the ability of letter-carriers to serve the public would be greatly advanced by the increase of their salaries from $1000 to $1200 a year, which, after all, is practically avowed to be the principal object for which they are "banded together."

A high grade of soldierly heroism and civic virtue is constantly displayed by the servants of this matchless system. Every night, in five thousand rushing, roaring mail trains, weary toilers are caged, continually perilling life and limb, swaying and shaking, trembling and lurching, as they handle with nimble fingers the precious messages, any one of which "misthrown," may break a heart or wreck a bank in some far-off State. Every day, in dark, cramped, crowded floors of city post-offices, fifteen thousand faithful clerks work, unseen, unnoted, straining every nerve and faculty in accurately dispatching the inconceivable multitude of missives and publications that are sending the life-throbs of commerce or intelligence or affection through the land, quickening the mind and energizing the spirit of our people.

Many of the demands of the employees represented by these organizations are neither ill-timed nor unjust. It cannot be denied that most officials and employees of the postal service are overworked and underpaid. The question, however, is, whether, after their present reasonable demands are met, the agitation will cease, or whether that success will merely be an incentive to still further demands. This is the result that those who are looking far ahead greatly fear. We have built up a gigantic business enterprise, employing thousands of intelligent, energetic, ambitious men in its different branches, and we see them solidly organized for the purpose of influencing legislation in their own interest. How far this movement will be carried beyond reasonable and just demands is one of the problems of the future—a problem so serious that President Roosevelt has felt constrained to issue an order forbidding attempts of public officials or employees to secure legislation for the increase of salaries.

Organization for more liberal pay is not confined to persons within the classified service. Twenty thousand of the lowest-grade postmasters, those receiving a compensation of less than fifty dollars a year, are entitled to retain the entire amount of their earnings. Yet even they are associated with their colleagues in an earnest effort to secure allowances for rent, light,

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and other perquisites! They have a weekly newspaper organ at Washington, and this extract from a postmaster's letter published therein shows that I do not misrepresent their demand: "It takes the same time to attend a small office as a large one. The bill we want is the one which favors the poor man. If some one will get up a bill that will put the little office that pays $25 a year on a footing with the one that pays $300 or $400, I am ready to support it." One strongly advocated proposition is to make the minimum compensation $100 per annum. As forty thousand post-offices in the country pay less than that sum, this number of postmasters would, under that law, each receive a gratuity of from ten to eighty dollars a year more than the total earnings of their offices, as reimbursement for sustaining the dignity of United States postmaster in a farm-house or blacksmith shop.

The problem of handling a prospective combination of carriers in the new rural free-delivery service is already becoming serious. During a recent debate in Congress one Representative said: "I shall insist that the rural free-delivery carrier is entitled to just as good a salary as the carrier who delivers mail in cities; the people who are the beneficiaries of this service will be satisfied with nothing less." As the rural carriers now receive $600 per annum, while mounted city carriers receive $1,300, and are organized to agitate for $200 additional, we may predict the result. Another Congressman attempts to formulate such a prediction:

> "It is the problem of serving, in the near future, 30,000,000 people, by 60,000 rural carriers, at an annual cost of more than $100,000,000. You will have salaries equivalent to city carriers, *plus* the Government horse and wagon; *plus* the hours of service by law; *plus* the annual leave and sick-leave; *plus* a substitute scheme—matters that will make my estimate of $100,000,000 a year grossly inadequate. In that estimate alone have I belittled the system."

These serious, but manifestly avoidable or curable, evils are certainly worth the careful, solicitous examination of all who seek the public welfare. Other defects more numerous and, possibly, more dangerous, because apparently inherent in the system, are reserved for future consideration.

HENRY A. CASTLE.

(*To be concluded.*)

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THE TOBACCO WAR IN GREAT BRITAIN.

BY LINCOLN SPRINGFIELD.

THE formation of the Imperial Tobacco Co. (of Great Britain and Ireland), Limited, with a capital of fifteen millions, sterling, in some respects marks an entirely new development of British industrial business. It is true that in recent years large amalgamations of manufacturers have been carried through in the United Kingdom, which are now in more or less flourishing circumstances; but they owe their existence to causes differing widely from those which operated in drawing together the leading firms of English and Scotch tobacco manufacturers, and were prompted by a desire to effect economies in administration.

For many years, a number of the most important and best-known English tobacco manufacturers,—that is to say, those firms whose productions are retailed to the consumer in packets bearing their names and registered brands and trade-marks, and therefore known in the trade as proprietary goods,—have had a working agreement or understanding amongst themselves, for the purpose of regulating the minimum prices at which their goods should be sold to the public by the shopkeepers, and thus preventing the ruinous cutting of prices which was formerly very common and much on the increase, especially in the large towns. At the same time, each of these firms competed keenly for the custom of the retail trade and for the patronage of the public for their manufactures, with very satisfactory results.

When, therefore, it became known that representatives of the American Tobacco Co. had actually secured the controlling interest in an English tobacco manufacturing company, and that the President of the American Trust had declared his intention of obtaining control of the entire tobacco trade of the United Kingdom, it was only natural that those firms which had pre-

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viously worked in friendly and honorable rivalry, but with a common understanding, should consult one another as to what steps should be taken to oppose a common foe. Not that Mr. Duke's arrival in this country was unexpected; it had been threatened for years, and various more or less authoritative statements regarding the American invasion had been in circulation for a long time. But when the report that a British company had succumbed to the attractions of American dollars was confirmed, representatives of the leading British manufacturers held a meeting at which it was resolved that they should unite their interests to resist the invader, and protect their valuable businesses. Having agreed amongst themselves as to a common course of action, they invited others to join them; and, on October 14th, 1901, a circular was issued to the trade and to the public announcing that the great amalgamation was an accomplished fact, and that thirteen firms, whose names were as well known throughout the British Empire as household words, had resolved to put an end to competition amongst themselves and to unite in the defence of the great industry which the ambitious American Trust magnate had declared his determination to capture.

Amongst these firms, the most important is W. D. & H. O. Wills, Limited, of Bristol and London, whose business was established nearly two hundred years ago. They were the first firm of tobacco manufacturers to send out their wares in packets bearing their name. This system, however, was quickly adopted by others, although Wills's Birds' Eye for many a decade enjoyed an enormous and almost exclusive sale in all parts of the British Empire. This business was formed into a private, limited company in 1893, with a capital of about £2,000,000; but the whole of the shares and debenture stock were retained by the partners, and therefore the undertaking remained, for all practical purposes, a private firm. During recent years, the business of W. D. & H. O. Wills has increased greatly; the company have three large factories in Bristol, employing about 5,000 men and women, and one in London; and it is reported that last year they paid about £1,500,000 to the government for duty, while their profits are supposed to have nearly approached seven figures. Many years ago, Messrs. Wills introduced a profit-sharing scheme amongst their clerical staff and the work-people, based on the net earnings of the company, and this has advanced continuously, until last year each

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participant,—and the arrangement includes all employees, from the general manager to the youngest child,—received a bonus of more than forty per cent. on the wages received during the year. Messrs. Wills are credited with producing two-thirds of the total quantity of cigarettes sold in the United Kingdom, and they are also the most important manufacturers of British cigars. Their export factory gives employment to about 1,500 hands, and the manufactures of the company are known on every market in the world, including the United States, in spite of almost prohibitive tariffs. Messrs. Wills's enormous export trade is largely owing to the well-known air-tight tin, of which they hold the patent rights, and in which their manufactures can be sent to distant parts without being affected by climate or age.

We have dealt thus fully with this firm, because, by their indisputable position in the tobacco trade of the United Kingdom, Messrs. Wills are probably more widely known than any other manufacturing firm in the world; while the excellence and reliability of their manufactures, and the high character of those responsible for the conduct of their business, have entitled the firm to exceptional distinction, even in a nation of business men. Two of the present members of the firm have been honored by baronetcies, and on a third the order of Knight Commander of the Bath has been conferred, as acknowledgments of public services rendered by them.

Bristol has long been an important tobacco centre, and Messrs. Wills show, with some pardonable pride, a letter to some of their predecessors from the Father of the American nation, advising a shipment of his tobacco in the following terms:

"VIRGINIA, *25th Nov., 1759.*

"GENTLEMEN,

"Some time this week I expect to get on board the 'Cary' for your house, 50 hhds. tobacco of my own and Jno. Parke Custis's, which please to insure in the usual manner. I shall also by same ship send you ten or 12 hhds. more if I can get them on board in time, but this I believe will be impracticable if Captn. Salman uses that dispatch in loading which he now has in his power to do.

"I am, Gentlemen,

"Your most obedient and humble servant,

"G. WASHINGTON.

"*P.S.*—My goods per Capt. Yates are arrived in James River, and I thank you for your diligence in sending them."

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It is not surprising, therefore, to find that other important tobacco manufacturing concerns are located in a city so long connected with the trade. The oldest business now carried on under the original name is that of Franklyn, Davey & Co., who, with Edwards Ringer & Co., control a great portion of the Superfine Shag trade of South Wales, drawing their supplies from the Richmond district of Virginia, and producing the same smoking-tobacco which was consumed by the earliest votaries of the weed —a strong, full-flavored article, which the modern cigarette-smoker would find ill adapted to his more delicate palate, yet containing the genuine features of the *Nicotiana Tabacum* which first attracted the early settlers of Virginia, and which Sir Walter Raleigh introduced to his fellow-subjects of Queen Elizabeth. Both of these firms are included in the Imperial Company.

Passing from Bristol to London, we find in the Imperial Tobacco Co. the important firm of Lambert & Butler, whose manufactures have for many years retained a strong hold upon the British public, and whose name is a synonym for excellence of quality, inferior to that of no other house in the trade. Another London house in the combine is the very old established firm of Adkin & Sons, one of the partners of which has been Vice-Chairman of the Tobacco Trade Section of the London Chamber of Commerce for some years, and whose cheaper manufactures enjoy an enormous sale in the eastern counties of England.

At Nottingham, one of the most important industrial centres of the midland counties, the Imperial Tobacco Co. are represented by John Player & Sons, Limited,—a business established half a century ago, which in recent years has developed into one of the best known and most prosperous tobacco manufacturing undertakings in the kingdom.

At Liverpool, the British port to which most of the American-grown tobacco is now shipped, the Imperial Company have secured three businesses,—Hignett Bros. & Co., Ltd.; William Clarke & Son, Ltd.; and the Richmond Cavendish Co., Ltd. These three important undertakings are widely different in the class of manufactures they produce. The name of Hignett has for a long time been known in connection with a number of the leading packet-tobaccoes sold throughout the United Kingdom, while Messrs. Clarke's business has been chiefly in what are known in the trade as "heavy goods," a term which includes such articles as Irish

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Roll, Pigtail, Cavendish, and similar manufactures. The amount of tobacco used in this factory being exceptionally large, Messrs. Clarke have long ranked as one of the most important supporters of the British revenue, owing to their very large payments of duty on the raw material. The Richmond Cavendish Co.'s business is conducted in a bonded factory, and consists entirely of tobacco manufactured on the principle which obtains chiefly in the United States and known in England as "sweetened."

Having made their arrangements with the above-named English houses, the men responsible for the formation of the Imperial Tobacco Co. turned their attention to the Scotch manufacturers, with whom business had long been known to be in a very flourishing condition. The proverbial preference of Scotchmen for their own countrymen, even in business affairs, had enabled the Glasgow manufacturers to avoid undue competition in prices, with very beneficial results to those interested. The oldest and largest of these firms is that of Stephen Mitchell & Son, reported to be the oldest firm of tobacco manufacturers in Scotland and possibly in the United Kingdom. For seven generations, there has always been a Stephen Mitchell in this firm, and Messrs. Mitchell are understood to rank third in the trade of the United Kingdom as to the amount of duty paid to government. The other Glasgow houses now absorbed in the Imperial Tobacco Co. are F. &. J. Smith and D. & J. Macdonald, both of which are furnished with new, up-to-date, splendidly equipped factories, fitted with the most modern machinery.

It is understood that arrangements have been completed with several other manufacturers for their inclusion in the Imperial Company at an early date; but of these thirteen firms already mentioned, it may be confidently stated that they practically held in their hands the cream of the British tobacco trade. The businesses were all in a flourishing condition, realizing handsome profits; their wares were household words, and literally in the mouths of the great majority of smokers in the United Kingdom, as well as in more distant countries. These businesses, too, were firmly established, and did not depend for their continuance on extravagant advertising. The English public are inclined to regard profuse expenditure in advertising with suspicion, realizing that money thus disbursed has to be repaid in some form by the consumer. If, therefore, the price is low enough to compete with

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manufacturers who adopt other methods, it follows, so the British public argue, that the quality is inferior. This, however, is a matter which may well be left to the discrimination of the smoker, who is not slow to decide the question for himself.

When Mr. Duke commenced operations at Liverpool last October, he adopted a course similar to that which made him famous in the United States. He at once reduced the price of some articles made in his English factory, and offered certain goods which the public were prepared to buy at low prices, conditionally on orders being given for articles which they did not want. Next, he cut down the price to the trade of some of the cigarettes for which his English firm was best known, and later reduced the prices of nearly all his American manufactures—by as much as forty per cent. in some cases. But the British shopkeeper and the British smoker were blind to this generous treatment, and did not respond in the way Mr. Duke expected. The sale of the cheapened articles decreased rapidly, and other action became necessary. So Mr. Duke resorted to still further and even more extravagant advertising, and has patronized the newspapers and bill-posters of the United Kingdom in such a way as to make them believe that their fortunes are now permanently assured.

All this time, the Imperial Co. declined to be drawn, and refused to be frightened by Mr. Duke's prodigal expenditure of the funds of the American Tobacco Co. They maintained an oyster-like silence as to their intentions, and could not be prevailed upon to follow Mr. Duke's example in slaughtering their profits by reducing their prices, and we are informed that they have not lowered the price of any of their manufactures, such a course of action having been quite unnecessary. Experience has taught the directors of the Imperial Co. that the smoking public are willing to pay a fair price for a good article, and that when the price of any proprietary brand is cut down the public believe that the quality of the tobacco is inferior, and the sale at once drops in response to the lowering of the price. A certain section may think and act on different lines, but these are not the mainstay of any business, and need not be seriously reckoned with. In England, more than in any other country, perhaps, it is quality that tells, and no amount of puffing will secure a large sale for an inferior article. Englishmen may, from an American standpoint, be slow, but, at any rate, they are sure. Another point

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which the President of the American Tobacco Co. had not reckoned with was the strong feeling of patriotism pervading all classes in Great Britain, and which was never so pronounced as at present. The objection to anything in the way of a Trust or a business "corner" has had a great deal to do with Mr. Duke's lack of success in his present campaign; and this feeling will undoubtedly become more deeply rooted and more effectively shown in the near future, owing to the operations of the Beef Trust, which have obliged English butchers to raise their prices; the purchase of several English match manufacturing businesses; the depressed state of the boot trade, in consequence of large imports of cheap American boots and shoes; and the sensation which has just been occasioned by the announcement of the Ocean Steamship Trust. Unless such methods of trading are curtailed in some way, the effects on the sales of American manufactures in the United Kingdom will be very serious, and it is not impossible that a practical boycott of everything produced in the United States may follow, in retaliation for what is considered unfair competition by Syndicate combinations, which seek to control important English industries.

At any rate, the effect of the American Tobacco Co.'s invasion of the United Kingdom, and of the boastful announcement of their determination to capture the entire trade of the world, has been distinctly favorable to British manufacturers, and particularly to the members of the Imperial Tobacco Co. In spite of the new competition, its business has increased enormously, and in some of the factories overtime work has been the rule recently instead of the exception it is supposed to be. At Bristol, one of Messrs. Wills's huge factories, employing nearly 3,000 work-people, is now being enlarged so as to accommodate 1,200 more. At Nottingham, an additional factory has just been secured to meet the needs of Messrs. Player's growing trade; and at Glasgow, Messrs. Macdonald have had to move into larger premises.

Up to the present, therefore, the American attack has not resulted in the closing of any of the Imperial Co.'s factories, and the directors are able to regard the future with equanimity. The American Tobacco Co. have had a branch in London for more than twenty years, and have spent scores of thousands of pounds in advertising their wares; but they have not been successful in establishing a trade of any importance for their manufactures.

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It is understood that one part of the American Tobacco Co.'s plans was to secure all the bright Virginia and North Carolina tobacco offered on the markets in the fall of 1901. The order was a large one, and it failed to come off. Tobacco is not an article which can be handled in the same way as coal, wheat, or petroleum, which, having been brought to market, may be stored indefinitely. It requires to be handled and cured quickly, and the excellent arrangements which regulate the markets in the tobacco-producing districts of the United States are quite sufficient to protect the farmer on the one hand and the independent manufacturer on the other from the disastrous consequences of a corner in leaf tobacco. If such a thing were possible, the shrewd men of Virginia, the Carolinas, and Kentucky are too much alive to their own interests to allow themselves to be left with only one customer to buy their produce, at whatever price that one purchaser chooses to pay for it. They realize the advantages derivable from a free and open market, and may safely be left to retain this as their strongest safeguard against the operations of any monopolist.

But, in every business where the material used is a natural product, the result of cultivation and dependent on weather or climate, exceptional years will occur, and 1901 was one of such special seasons. When the last crop came to market in the South, it was found that it was below the average in quantity and above the average in quality; or, rather, that the cheapest grades of tobacco were scarce. Thanks to the large stocks they held in the King's warehouses, the Imperial Company were, to an exceptional degree, independent of the tobacco crop of last year, and could afford to wait until one more abundant and more suitable for their purpose should be harvested. At the same time, everything offered at reasonable prices was readily bought by the English manufacturers; but, owing to the action of the American Tobacco Co., prices were put up early in the season to a figure which practically closed the English markets and prevented sales to manufacturers, under the circumstances already referred to. The Imperial Tobacco Co. were not slow to realize the position and, after due consideration, decided that old methods must give place to new necessities.

The English tobacco manufacturers have hitherto obtained their supplies of American leaf chiefly through importing mer-

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chants or commission houses, who, having received consignments from their agents in the United States or from independent shippers, have sold the tobacco thus placed in their hands to the manufacturers. Some manufacturers have, on the other hand, been in the habit, for many years, of making purchases direct from their own agents in Virginia and Kentucky. Naturally, the Imperial Tobacco Co. were reluctant to break through business methods which had worked satisfactorily for generations; but they felt that in future they must be on an absolute equality with their strongest competitor in a matter of such importance, and that they were compelled to go to the source of supply and get as near the producer as possible, without the intervention of any middleman. They therefore determined to transfer their market for purchasing leaf to the United States, and with this object in view they have established a branch in Richmond, Virginia, under the control of a resident director, assisted by some of the most capable and experienced men in the tobacco district, and have arranged to have their own stemmeries and factories with specially retained buyers on all the principal markets. Such a course will enable the Imperial Tobacco Co. to obtain supplies at first hand and at market price. They can face the possibility of severe competition from the American Trust with composure; for they realize that, if the Trust puts up the market price, the effect will be the same to both: but with an important difference. Being undoubtedly larger purchasers of bright Virginia tobacco than the Imperial Tobacco Co. are at present, the Trust will suffer more by having to pay more dearly for their large purchases than the Imperial Tobacco Co. will for their smaller requirements. At the same time, the excessive competition which has prevailed, owing to a very large number of factors and shippers bidding against each other on the Virginia markets, in order to send supplies to their agents in Great Britain, will to some extent be removed; although it is not anticipated that the Imperial Co. will be altogether independent of the London and Liverpool merchants and brokers, but that they will supplement their own purchases in Virginia by whatever may be sent to the United Kingdom on consignment. It is, however, probable that this new line of action on the part of the Imperial Co., which represents a purchasing power of many thousands of hogsheads of tobacco annually, may have the effect of leading a number of shippers and fac-

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tory owners in America to retire from the tobacco business altogether, as in future they will not be able to rely upon as ready sales at remunerative prices for their shipments as heretofore, seeing that most of the largest buyers, who were formerly in active competition against each other, are now joined in one business concern, and that they intend to buy as near the tobacco-fields as possible.

At the outset of the campaign, the Imperial Co. promised their customers a bonus on their purchases of the company's proprietary goods. No details of the amount to be distributed could be given at the time; but as soon as the prospectus of the company had been issued, and the capital subscribed several times over by the public, the bonus scheme was published to the trade. One of the conditions imposed upon those who desired to share in the amount to be distributed was to the effect, that those who participated should, if required, discontinue the sale of any of the goods of the American Tobacco Co., Ogdens Limited, and of any other manufacturer to whom the Imperial Co. might take exception. This clause was, to some extent, misunderstood by the traders, who thought they saw in it an attempt to establish a monopoly, which in a free country like England would always be most unpopular. It is, however, probable that the Imperial's stringent condition was directed only against the two above-named undertakings,—now practically one business concern; and the mention of other manufacturers is understood to have been made only in case any additional tobacco-manufacturing businesses were purchased or controlled by Mr. Duke's company. This was afterwards made clear by the Imperial directors, who, in response to the representations of some of their customers, modified the terms of their bonus agreement, with the effect that a very large number of wholesale and retail tobacconists throughout the United Kingdom readily availed themselves of the opportunity of securing the benefits offered them in the Imperial's profit-sharing scheme. The offer of the Imperial Co. was a distribution of one-fifth of the total net profits of the company, and, in addition, the sum of £50,000 was to be paid to those customers accepting the company's terms, on their trading during the first six months' business,—this latter amount being, it is understood, the personal gift of the directors. It is, of course, impossible to say at present what sum will represent one-fifth of the Imperial

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profit; but, as the average profits for three years ending June, 1901, were given in the prospectus at over £1,000,000, sterling, and as it is known not only that very considerable economies will be effected by the amalgamation, but that all the combining firms have been exceptionally busy, and that their profits have greatly increased throughout the period for which the average profits were certified, it may be taken for granted that the profits for 1902 would approximate one million and a quarter pounds, sterling. This would provide a very handsome sum for distribution, and the company's customers were not slow to appreciate the fact. But Mr. Duke, in his feverish anxiety to part with the American Trust's earnings, promptly capped the Imperial Co.'s offer by one which not only excited astonishment but furnished a great deal of amusement in the tobacco trade. The sum of two hundred thousand pounds is to be distributed by him amongst the purchasers of the American-Ogden manufactures, and, in an uncontrollable outburst of generosity, Mr. Duke, not satisfied with bleeding the holders of the stock of the American Consolidated Co., gave away by a stroke of the pen the whole of the profits earned by Ogden, Limited. Not that this will in the least affect the amount to be received by Mr. Duke's customers; for, while the last balance sheet issued by Ogden, Limited, before its capture, revealed an available profit of something less than £40,000, it may be taken as certain that a very much larger sum than this has been lost by Mr. Duke in his benevolent desire to supply the retailer with tobacco at less than cost price, and in the extravagant advertising of five-a-penny cigarettes with which he opened his British campaign, and which has since been maintained, to the wonder of the wholesale and retail trade and the delight of bill-posters and newspaper proprietors. Probably, therefore, the shareholders in Mr. Duke's American Co. will be called upon to foot a much heavier bill than would be represented by his offer of £800,000 in four years.

The recklessness of such an offer may be estimated by the fact that many leading retailers have never sold Ogden's manufactures, as not being sufficiently in demand to make it necessary for them to do so; and, as we have already remarked, mere cheapness in price affects the sale of tobacco in England only slightly, while reductions in prices at once arouse suspicion as to quality.

The London *Times* remarked in a recent article:

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"Whether by design or accident, the offer of the Imperial Tobacco Co. has been a huge success. It has drawn the American Trust, and developed the comedy of the situation. The Trust is evidently overjoyed at the smallness of the offer, and has hastened to show what it can do in the same line. It offers to pay to the retailers, by way of bonus, the whole of its profits upon sales in this country, and to add to that a further sum of £200,000 per annum. This splendid evidence of friendship is guaranteed to last four years. For all that time this generous and large-souled combination is going to work for nothing, simply to benefit the British retailer, Nay, more, it is going to pay £200,000 a year for the privilege of showering wealth upon him. There is no parallel to this magnanimity, except perhaps in the case of that friend of country yokels who sells sovereigns for sixpences. But the nobility of the American Trust does not stop even here. It calls attention in language of sonorous indignation to the unworthy attempt of its rival to boycott other people's goods. No design so repugnant to the cherished principles of free and independent Britons has ever been harbored by the American Trust. No degrading conditions are attached to its splendid generosity. All it asks is that its goods shall be fairly displayed and sold alongside of any others that the retailer may be so blind to his best interests as to admit into his shop. This sort of thing invigorates one's faith in human nature. Goods at cost price for four years, and a bonus of £800,000, to the struggling British traders! We are almost ashamed to speculate upon what is to happen at the end of the four years. To doubt the persistence of such noble disinterestedness seems almost infidelity. Can any one be guilty of the turpitude of asking whether the £800,000 is in the hands of trustees? Can any one entertain a doubt about the auditing of the manufacturing accounts, or the inclusion of the £200,000 in manufacturing expenses? For our part we prefer to believe that, when the four years expire, yet greater boons will be offered to us. By that time, no doubt, a scheme will be elaborated for adding to the enrichment of the British retailer the provision of the British consumer with the finest cigarettes in the world at twenty for a penny!"

Thus the bonus scheme of the Imperial Co. brought Mr. Duke into the open in his true colors, and such a revelation is probably, of itself, worth to the Imperial all they will have to distribute under their agreement with their customers.

One of the smartest moves on the part of the Imperial directors was the securing the control of the business of Salmon & Gluckstein, Limited, the largest retailers of tobacco in the world, who own about one hundred and fifty of the principal shops in London and provincial cities. This firm had for some years adopted a policy of cutting prices, and selling at small profits to the injury of other retailers. Under Imperial control this will not be possible, and they will have to sell at the same prices as other re-

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tailers, who will readily appreciate the improvement in their lot which must result from such a course of action.

What the next move on the part of the Imperial Tobacco Co. may be has not yet been divulged by the officials responsible for its control. Probably a good deal depends upon the action of the American Trust. The Imperial Co. have so strong a hold upon the British public that they can regard Mr. Duke's offers to the trade without undue alarm, whilst acting on the wise injunction that a state of preparedness for war is the surest way to insure peace; and they may be trusted to secure themselves in a strong position, having a far more intimate knowledge of the requirements and desires of both the wholesale and retail traders than their opponents can possibly possess.

It is rumored that, in all probability, the Imperial Co. may carry the war into Mr. Duke's own country and fight him on his own freehold, as, it is understood, he considers the United States to be. Such a development is by no means unlikely; for, although a great deal of amusement may occasionally be obtained by "twisting the lion's tail," the noble beast has a way of retaliating in a forcible manner when once he is aroused. It is believed that not a few engaged in the tobacco business in the United States would welcome the starting of a factory under the auspices of a powerful company, possessing ample resources and conducting its business on fair and equitable lines, and opposed to the methods employed by the Consolidated Tobacco Trust. Other reports have been current that an arrangement exists, or is under consideration, with some of the most important manufacturing concerns in America and Canada who still are outside the Trust. Whether there is any foundation for these statements we cannot at present say definitely; but we may feel sure that a good deal more will be heard of the Imperial Tobacco Co., not only in Great Britain, but also in that great country whose ambitious representative called the Imperial Company into existence.

LINCOLN SPRINGFIELD.

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METEOROLOGY AND THE POSITION OF SCIENCE IN AMERICA.

BY PROFESSOR CLEVELAND ABBE.

A RECENT number of the NORTH AMERICAN REVIEW contains an article, entitled "America's Inferior Position in the Scientific World" that has attracted considerable attention. We notice that the author has said nothing with regard to the very high position that America holds in several branches of science; and, therefore, I may be allowed to say a few words about one of these—namely, meteorology.

Before entering upon that specific subject, however, it may be well to observe that we must avoid confounding two distinct ideas, viz., "America's position in the scientific world" and "the position of science in America." The former is secure, the latter is still unsatisfactory; and it is the latter that we may seek to improve by practical means. It is not denied that America has thus far honored her inventors more than her men of research. In popular esteem the practical is often put higher than the theoretical, because it comes nearer to the popular heart. The investigator is liable to be neglected in comparison with the teacher or the lecturer; and the latter, in turn, are rewarded and supported less liberally than the inventor or manufacturer. Even in Europe the great engineers generally receive more attention than the investigating physicists, although the latter lay the foundation for the work of the former. The same holds true in astronomy, chemistry, mechanics, and every other branch of science. The knowledge gained by investigation always has formed, and always will form, the only firm foundation on which to build up invention and all the arts of civilization. But it is folly to speak of one class of men as greater than the other; each is equally essential to the complete whole.

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Those who wish to help American science must do so by encouraging and stimulating that spirit of patient research which is the very soul of science. We want young men of intelligence who are willing to spend years in the search for knowledge—not merely those who have attained a collegiate degree for learning, but those who have a post-graduate or doctor's degree for research. Research has a reflex educational value to a young man; it is the practical application of his knowledge and talents; it stimulates his intellectual growth, just as the raising of a weight strengthens the muscles.

I.

The outstanding problems in science are difficult, as they have ever been. The very simplest ideas that are commonplace to us cost years of thought before they were first clearly perceived, and centuries of teaching before they were accepted by mankind at large. The atmosphere offers problems so complex that twenty years ago one of the ablest of Englishmen assured me that "they are too difficult to make it worth while for us to attack them at present." Their exact solution must wait until pure mathematics is able to cope with them. In so far as America has even approximately resolved any of these difficulties, she should receive full credit.

The older branch of meteorology, named climatology, considered purely as a study of statistics, began in America about 1817, under the inspiration of Mansfield and Lawton; it was especially fostered by Henry in the Smithsonian, by Lovell as Surgeon-General, by Schott in the Coast Survey, by Watts the Commissioner of Agriculture, and it is now developed by the Weather Bureau. Maury's "Winds and Currents of the Ocean," Coffin's "Winds of the Globe," Schott's "Tables of Temperature and Rainfall," were superior to any similar works published in Europe at corresponding dates. American citizens have also done great work in foreign countries—such, for example, as that of B. A. Gould and W. G. Davis on the climatology of the Argentine Republic. Many colleges and schools teach climatology; Harvard has an admirable school; Johns Hopkins and other universities have excellent courses on this subject.

In the younger branch of dynamic and physical meteorology, our countrymen and our Weather Bureau have been very conspicuous. James Pollard Espy of Philadelphia devoted his life

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to this subject, and it is impossible to speak of the progress of modern meteorology without mentioning him who is recognized everywhere as its founder. We owe to him the discovery and demonstration of the part played by the latent heat of aqueous vapor in affecting the temperature and motions of the atmosphere. He was able to show that radiation and conduction, which had hitherto alone been thought of, were insignificant factors as compared with mechanical cooling—that is, the consumption by expanding air of its own internal heat when it has to do external work. This principle was demonstrated experimentally by Espy long before our modern thermodynamics was thought of. His writings on this subject, his experiments with his two forms of nepheloscope and his public addresses, both in this country and Europe, were so convincing that they form the starting-point for the study of the thermodynamics of the atmosphere. Although Thomson and Joule greatly developed thermodynamics, mathematically and experimentally, its bearing on meteorology was neglected by Europeans until about 1874, when Julius Hann wrote: "We must return to Espy and Ferrel." Since that date, Germans have done much, but they have not surpassed the work done by recent American meteorologists.

To Espy we owe the invention of the whirled or sling psychrometer, and a method of determining the moisture in the air which is now recognized as the only competitor of the ventilated psychrometer, recently improved by Assmann.

Espy's study of the ascending and descending currents of air led him to the true explanation of the formation of warm foehn winds, cumulus clouds, thunderstorms and tornadoes, and the regular recurrence of strong winds in the daytime and feeble winds at night. It is a significant proof of European ignorance of America, that Espy's conclusions on the latter subject were independently deduced thirty years later by Koeppen, so that Germans are now willing to speak of the Espy-Koeppen explanation, although, according to the established rules of ethics, the credit belongs to Espy alone.

Closely connected with Espy's theory of the formation of clouds, is the work done by Carl Barus at Washington and Providence on the phenomena of cloudy condensation. If he is allowed to prosecute his work further, he will eventually tell us how rain and lightning are formed.

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The winds and storms of the atmosphere can be best studied by the use of graphic charts, showing what is going on over wide regions, both at the surface of the earth and above it. In this branch of study Espy was indefatigable, and his popular nickname "The Storm King" was well deserved. Beginning with local thunder-storms in Pennsylvania, he organized, in 1831, a special committee of the Franklin Institute, and in 1836 a joint committee of the Institute and the American Philosophical Society. He secured hundreds of observers, and compiled many storm maps as the basis of his work "On the Philosophy of Storms." In 1842, he came to Washington as meteorologist to the Government, and was assigned to duty, first under the Surgeon-General of the Army, afterwards under the Secretary of the Navy, but eventually, after 1848, under Professor Joseph Henry. In these positions he compiled a continuous series of daily weather maps of the United States, many of which were published in his four successive reports. He established numerous generalizations relating to the storms and some rules by which weather predictions could be made and were made. As Europe boasts of Cuvier, Agassiz and Humboldt as the founders of comparative anatomy, biology and climatology, so must America claim Espy, Redfield, Loomis and Ferrel as founders of the comparative study of daily weather conditions.

William C. Redfield studied the mechanism of storms on the ocean, as Espy did those on land. From the hurricane of September 3, 1821, onward, numerous great storms on the Atlantic and Pacific were examined by him. Redfield's work consisted in most diligently collecting and charting marine reports; and his deductions gave us the first fairly correct insight into the mechanism of a hurricane. This was an advance in marine meteorology superior to anything that had occurred up to his time, and assured us that storms in all parts of the world were analogous and were controlled by a few simple laws.

The study of the atmosphere on a grand scale has been the special field of American meteorologists. The beginnings made by Espy and Redfield were developed by the Smithsonian Institution so as to cover the whole continent, and by Maury so as to cover all oceans. Eventually, in 1873, General A. J. Myer, as Chief Signal Officer of the Army, was able to organize a general international, simultaneous service for the globe, and for many

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years he published a daily weather map of the whole Northern Hemisphere. For the first time in the history of the world, this international bulletin and map made possible the study of the atmosphere on a proper scale.

America has a pre-eminent right to the glory reflected by the name of William Ferrel, whose innate genius, developed by persistent study under most adverse circumstances, enabled him to do for dynamic meteorology what Espy did for the physics of the atmosphere. The publication, in 1856, of Ferrel's short popular paper on winds and currents, and, in 1858-60, of his mathematical paper on the motions of fluids and solids on the surface of the rotating earth, is, we believe, everywhere recognized as the starting-point of modern dynamic meteorology. Of course, his papers, which were published in journals unknown in Europe, suffered the neglect usually experienced by utterances which are too far ahead of the time. Although a few separate prints of his memoir of 1860 were sent both by Ferrel and myself to European students, and although Ferrel's work was the basis of my "Probabilities" in Cincinnati and Washington, he was not recognized in Europe until 1875, when, for the benefit of the readers of the "Journal of the Austrian Meteorological Society" Professor Hann gave an appreciative review of one feature of Ferrel's work, namely, the demonstration that every movement of the atmosphere is accompanied by a deflection to the right in the Northern Hemisphere, by reason of the daily rotation of the earth on its axis.

Ferrel's explanation of the cause of the rotation of storms; his general theory of atmospheric circulation; his explanation of the origin of the low pressures in the Arctic and Antarctic zones and in the Equatorial belt, and of the high pressures under the Tropics; his determination of the frictional resistances of the land and water to the wind; his explanations of the phenomena of waterspouts, tornadoes, hail, monsoons and other matters too numerous to mention, are all to-day accepted with various modifications due to the recent progress of mathematics and physics. Ferrel placed the mechanics of the atmosphere on the right foundation, removing errors entertained by Europeans who had not properly studied the laws of fluid motion. More elegant mathematical solutions of some of his problems have been given by later European students, and the best general view of the sub-

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ject has lately been published by Professor Bigelow, of the United States Weather Bureau, so that American science still remains at the head, so far as concerns this branch of meteorology.

Ferrel also knew how to make practical applications of his knowledge. We have from him the best explanation of the action of the sling psychrometer, and tables for computing atmospheric moisture; a system of reduction of barometric pressure to sea level; the proper method of using the bright and black bulb thermometers *in vacuo,* and many other improvements bearing on astronomy, meteorology and mathematics. His machine for predicting the tides is still used in the United States Coast and Geodetic Survey as a labor-saving contrivance. He was the first to demonstrate the influence of tidal friction in retarding the rotation of the earth on its axis.

At the present time, there are among meteorologists in America two men whose names are as well known in Europe as here—namely, Professor Marvin, skilful in the laboratory, and Professor Bigelow, accomplished in mathematical analysis. The same may be said of the meteorologists at the Blue Hill Observatory, where special attention has been given by Messrs. Rotch and Clayton to the study of the upper air. American work is worthy of the highest praise and has stimulated similar work in Europe. As regards organization and practical results, the United States Weather Bureau, under Professor Willis L. Moore, is doing the greatest and best work that has ever been done in any applied science; in its way, this Bureau is equal to the Pasteur Institute or anything else that Europe has to show. No European would deny that, in this respect, America is easily the first in the world.

II.

After all, however, it is less important to defend American science from criticism than to seek out methods by which future progress may be stimulated. I do not expect great benefits from large central institutes, clubs or societies; the present desideratum is the production of a large number of able investigators. So far as research is concerned, I think its best interests would be conserved by encouraging young men to attain the degree of Ph.D. by doing at least one good piece of original investigation. When we have thousands of such young men, we shall easily find the men of promise through whom science will be advanced.

A collegiate education in the ordinary sense of the word does

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not make men of research, but men of learning. The degrees of A.B., A.M., B.S., M.D., C.E., etc., are given for excellent knowledge of the subject only. College courses and laboratory practice teach the youth what has been done; they prepare him to begin original work for the increase of knowledge. When it comes to this point in their courses of education, however, many excellent students display a certain sluggishness, or, as Tyndall would say, "a lack of the scientific imagination." Our problem is to stimulate and cultivate the intense mental energy needed by the investigator. Those who have a special genius for research are so desirable as leaders for younger men that a first-class university does not hesitate to seek them out and attach them to itself. A beautiful illustration of this fact is found in the following quotation from the report of President Eliot, of Harvard, for the year ending September 26th, 1901:

"Last summer, the Prussian Government offered our Assistant Professor, Theodore W. Richards, a full professorship of chemistry in the University of Göttingen, and described the professorship 'as offering ample opportunities for chemical research.' . . . . The desire of the Corporation to retain the services of Professor Richards caused that body to consider the conditions under which it was reasonable to expect professors engaged in instruction to be also successful original investigators. To determine the just relation between instruction and research is one of the most difficult of modern university problems . . . . To provide a laboratory, or a library, or a salary derived from endowments, is not the whole of proper university action aimed at the production of competent investigators. The university service for such men must be wisely planned, and those plans must be executed with far-seeing skill. The endowment of research is becoming an attractive object for private benevolence, but the world has little experience of wise schemes for this purpose. The Corporation endeavored to make with Professor Richards an arrangement of his work which will leave him a teacher, and yet give him time and facilities for chemical research and for creating a school of chemical investigators . . . . It is a pleasant feature of this unique negotiation that it holds out a hope that America may before long begin to repay to Germany some of the immense educational benefits which the German universities have conferred on the American."

I am told that Prof. Richards's work in inorganic chemistry, and especially the determination of the atomic weights, had placed him in the front in a field that had once almost wholly belonged to Germany.

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Although some American universities thus appoint men of research to their professorships, many appoint their professors under the influence of other ideas. Of course, minor considerations inevitably come into play in the ultimate decision as to the filling of a given vacancy; yet, if the first and major consideration is simply, "What has this man done that demonstrates his intellectual energy, his productiveness, his enthusiasm, his intimate knowledge of the subject, his fitness to lead those who must be taught?" then we shall certainly rule out all undesirable candidates. This principle has been clearly apprehended in Europe, and has been systematically developed to a remarkable extent in Germany. Her prominent position in the scientific world results primarily from this, namely, that her universities have recognized the value of the rule that "the men of the highest and deepest knowledge are shown by their researches, therefore no one shall be appointed *Lehrer* or *Privat Docent* who has not *already, in one or more ways, contributed something original and* important to the increase of knowledge regarding his special subject; and no one shall retain these humble places, or be advanced to the higher professorships, who does not continue to contribute original works that add still more to our knowledge."

Youths who enter German universities and technical schools see that successful research is properly rewarded, and they shape their lives accordingly. The friends of education in America must not labor exclusively for the diffusion of knowledge and ignore the increase of knowledge. The truths of nature, be they material or spiritual, are worth the great labor that it costs to get at them, and we are well repaid for disseminating them. Whether we study history or philosophy, physical science or religion, politics or sociology, still investigation and research, experimentation, observation and logic will always be in order. These alone can lead to the increase of knowledge. Every candidate for the degree of Ph.D. should know that a brilliant thesis in research will bring him substantial encouragement. Under this stimulus, the German universities have, for the past five generations, been turning the best national thought toward the development of the genius for investigation in every possible field of knowledge. Tens of thousands have received some recognition for research, and ten per cent. of these have become eminent by their discoveries. Not only the university but the whole country profits

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by scientific progress. Her manufacturers, her ship-builders, her railroad, telegraph and mining engineers, and even her ruling aristocracy, have gone through her universities or technical schools, and are thoroughly imbued with the truth of the principle that "knowledge is wealth, power and pleasure."

We must increase our national activity in this respect. Our universities send forth annually perhaps one-tenth as many young men devoted to research as does Germany. It is a matter that needs no demonstration that there is about an equal proportion of youths of innate intellectual ability in America and in Europe, but these die like the wasted seeds unless circumstances contribute to their proper growth. I look upon the development of a genius among men as the florist looks upon a so-called "sport" among flowers; the latter grows wherever a seed of abnormal proclivities accidentally falls into a favorable soil and develops into a new variety of plant. Such were Copernicus, Tycho Brahe, Galileo, Kepler, Newton and many other famous men. It is the province of our universities to nourish a host of post-graduate research students, in the confident expectation that here and there there will develop a genius that shall be a tower of strength.

As the prospect of congenial employment encourages young men to do good work in hope of recognition, so the endowment of research, and a little assistance from trust funds administered in the interest of research, encourage the older men, and often decide whether a given study shall be undertaken or not. The past history of funds for the endowment of research will, I think, show that applications for assistance, as compared with the actual grants of aid, have been in the ratio of ten to one. The total number of applications, rather than of the grants, indicates the intellectual aspirations of our countrymen. It shows what our men wish to do, but are only able to accomplish when they have financial help. The administrators of these funds sometimes allow them to be expended on apparatus, at other times on incidental expenses, the hire of assistants, office rent, etc.; but they rarely authorize the responsible chief of the investigation to apply the money to his own living expenses. They proceed on the assumption that he has an income from his own fortune or from other daily work, and that the proposed research is a minor undertaking, additional to current duties. This policy results in withholding help from the young scientist, and forces the older ones

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to be very cautious in applying for help. The most important investigations demand much time, and the student should be free from all other cares and completely devoted to the work in hand. It is certain that science has only received bountiful returns when her investigators have been supported steadily and with generosity, straight through the years of toil that their work required.

The problem of stimulating research is not a new one in the United States. A small percentage of Smithsonian and Hodgkins funds has always been available, and similar smaller funds are in other hands. Several millions have also been invested in institutions intended for research and instruction, such as astronomical observatories, chemical and physical laboratories, geological, zoological and botanical museums or gardens, and scientific libraries. But the endowment of research results in important additions to our knowledge only when the right men are thereby set to work. Undoubtedly, America has several such men.

The law of supply and demand applies to science as well as to commercial matters. If there be no demand for improvement, the improvements and the inventors retire alike into the background, or are altogether eliminated. The Patent Office has been organized to secure the rights of inventors and stimulate that side of our national progress. No analogous organization has as yet been established for the defence of the rights of the original discoverers. We have no national or federal recognition of the general principle that original research, the discovery of new laws or new elements, new stars or new truths of any kind in nature, is of any importance whatever to the individual or to the nation. However, our governmental departments do make appointments on the basis of work done in history, biology or physics, and this policy is bringing about good results.

III.

As regards the future of the science of meteorology, we have to build up from the bottom. I have elsewhere pointed out that our educational institutions have as yet confined themselves to climatology, and offered too little encouragement to the study of the fundamental dynamics. The Weather Bureau has found it necessary to rely entirely upon its own courses of instruction in preparing and promoting its observers and forecasters. Can it be true that the study of this subject is not fully

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appreciated in America? Such neglect should be remedied by the establishment of schools of meteorology on an equality with other schools of science. Do we need hundreds of astronomical schools and not one meteorological? There may be a hundred young men in the country studying elementary science who are sufficiently interested in meteorology to think of devoting their whole energies to that subject if they but knew of a teacher, and had any assurance that they could earn a livelihood and make a career in this profession. They should not be told that there are no opportunities for them. There should be at least one school of highest character for meteorological research. The admirable papers published by the students of Professor R. S. Woodward, especially those of Cottier, Ling and Davis, on problems of hydrodynamics and the atmosphere, show that under such a master an important school of meteorology would rapidly develop. The works of Mendenhall, Trowbridge, Marvin, Barus and other experimental physicists show what they could do for our science if they were able to devote their whole time to it.

It is not to be denied that, at present, the progress of meteorology in this country depends very largely upon the encouragement given by the United States Weather Bureau to the highest class of scientific research. This Bureau centralizes the entire Government patronage in this respect. There is scarcely an observing station in the country that does not report to it. Its telegraphic organization for reports and daily forecasts reaches every point on the continent. Its forty or fifty sections publish monthly, in great detail, the climatic data of each State and Territory. The whole service is recognized the world over as a model in respect to thoroughness, accuracy and promptness. Moreover, every one is stimulated by its Chief to special study and work under the assurance that his personal ability will be recognized in some agreeable way. The Bureau is a purely Civil Service organization, but that does not mean that it does not need the spirit of progress. It needs to utilize men of research and men of progressive ideas in every branch of its work. Its daily routine of observing and forecasting is not in itself research. The experience of the Weather Bureau is like that of every other organization in the whole long history of science, to the effect that ability and success in research do not result from organization. The gift for research is a style of intellectual energy that refuses to be bound

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by regulations. An energetic investigator immured in the walls of a great organization may be as much out of place as a wild bird in a cage. He must have intellectual freedom. He can utilize, but must not be dominated by, his surroundings. His mind sees something better than is seen by others, something that is scarcely dreamed of by them. Nature gives him a glimpse of some one of her hidden possibilities, and he has the genius to follow the trail and convert his glimpse into a glorious reality for the rest of us. He studies nature, not policy. It is likely that there are many such men outside, as well as inside, the service. In order to give this latent talent a chance to reveal itself, the Secretary of Agriculture has taken two important steps. As to the outside talent, he has established a corps of student assistants in all the varied branches of his great department. If these student assistants are chosen preferably from among the holders of the university degree of Ph.D., the greatest possible stimulus will be given to post-graduate work in the scientific schools throughout the land. In order to encourage the talent within the Meteorological Service, Secretary Wilson has encouraged Prof. Willis L. Moore to give the broadest development to a modest periodical entitled "The Monthly Weather Review." This opens its columns to all who are teaching, observing or investigating along the lines of Weather Bureau work, and, thereby, does something to stimulate research and progress. As to those employees of the service who have already shown ability in research, but are much encumbered with executive and routine work, we can only hope that times will change for the better, so that they may have opportunity to show what they can do.

In general, the present development of science in America is highly encouraging. Future progress will depend, not so much on the formation of influential scientific clubs as on our laboratories, our periodicals, our local societies and the policy adopted, as to patronage, by the government and our universities. Meteorology will especially advance whenever some one establishes a meteorological laboratory in connection with some first-class university, giving it conveniences for experimentation on a large scale, furnishing it with an experimental physicist, a mathematical physicist, and several student fellowships, and allowing these abundant time to work out completely the first few problems that they may see fit to undertake.

CLEVELAND ABBE.

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THE NATIONAL DEBT OF THE GERMAN EMPIRE.

BY DR. ADOLPH WAGNER, PROFESSOR OF POLITICAL ECONOMY IN BERLIN UNIVERSITY.

THE present German Empire was formed, as we know, by the Union in 1871 of the South German states with the North German Confederation and the addition, after the peace of Frankfurt in 1871, of Alsace-Lorraine, territory which had been wrested by France from the old German Empire.

Till the outbreak of the Franco-Prussian war in the summer of 1870, the North German Confederation, itself only in existence since 1866-67, had made but modest demands upon the State credit—grants amounting to 17 million thalers (51 million marks) only having been obtained for naval and coast defence purposes. This sum, however, was never entirely placed, nor was it strictly speaking a loan; but it was raised by the issue of Treasury Bonds to the amount of 13.45 million thalers (40.35 million marks). A considerable quantity of these bonds were several times repaid and re-issued for small amounts, but they were finally paid off in 1872.

The expenses of the war of 1870 were borne by the North German Confederation and each of the South German States on its own separate account. The new loans raised for this purpose by the North German Confederation were partly in the form of a five per cent. Consolidated Loan of 120 million thalers (360 million marks) in July 1870, of which, however, only 113.37 million thalers were issued; partly by the issue, from time to time, of Treasury Bonds at short dates, which were soon called in; and partly by the issue of Treasury Bonds, running for five years. Thus, by the end of 1871, there was a new North German Confederation Debt of 220,020,801 thalers.

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However, the successful issue of the war and France's war indemnity of five milliard francs enabled the Confederation to repay these loans in full in 1872, so that only a few unredeemed bonds still exist. A small portion of the debt (17,000 marks) is still outstanding.

For the relief of the economic disturbances consequent on the war of 1870, the North German Confederation started the so-called "Advance Banks" *(Darlehnscassen)*, empowered, by means of specially issued State paper money, to give loans at fixed interest to trades-people, and so forth. This paper money was issued in amounts of 5, 10, and 25 thalers; and though it was not legal tender nor convertible into coin on demand, it was taken in payment at all public offices and, owing to the favorable issue of the war, never fell below par. Of the 30,000,000 thalers granted for this purpose, 29,651,000 thalers were issued, but in 1871-72 the issue was almost entirely redeemed, and the Banks themselves closed. By 1873, therefore, the German Empire, in its character of legal successor to the North German Confederation, actually had no State Debt.

The debt came into existence again in 1875, when the French War Indemnity had been absorbed in the costs of the war, the repayment of loans, joint Imperial expenditure, the creation of Imperial Funds, and in distribution among the separate States. Including such sums as the 200 million francs contributed by the city of Paris, the surplus from the taxes raised in France, etc. (55.93 million marks), and the value, with its accumulated interest, of the Alsace-Lorraine Railway (assessed at 260 million marks), the Indemnity had amounted to 4,467,096,402 marks.

The new debts since 1875 had been contracted partly in the form of loans, partly in the issue of Treasury Bonds. The loans were chiefly employed on extra outlay for army and navy, for fortifications, for the construction of so-called strategical railways, with subsidies to the separate States for a similar purpose. The fact that Germany's present position among the Continental Powers is, in great part, due to her having applied so much of the War Indemnity and of the fresh loans she raised since 1875 to the use of the Army, fully justifies such employment of those funds, just as the founding and expanding of her naval power afford a similar justification for the sums used and loans raised for this purpose.

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The legislation upon the subject of the new increase of the navy and the "East Asiatic Expedition" (as it is called) to China has produced an augmentation of the national debt, and the former measure will continue to do so for some years to come. Additions to the debt have also taken place upon account of the army, etc., and will do so also in the future. This may be seen from the following figures:

Year.	Total of the Imperial Debt in Millions of Marks.	Imperial Loan in Millions of Marks.	Cost of the Debt according to the Budget, in Thousands of Marks.
1898	2302	2182	72,288
1899	2343	2223	75,519
1900	2419	2299	77,701
1901	2500	2380	88,543
1902	c. 2750	c. 2630	——

Of the Imperial Loan upon April 1st, 1900, there were 1,240 millions at 3½ per cent., 1058.5 at 3 per cent.; 80 millions of 4 per cent. Treasury bills were added to this on April 1st, 1901, and, later still, 300 millions more of 3 per cent. loan.

By the Act of April 10th, 1898, a considerable increase of the navy had been resolved upon. As this increase was not regarded as sufficient, the Imperial Government introduced a new bill, which passed in the Reichstag after violent political and Parliamentary conflicts, although not exactly in the form originally proposed. According to this scheme, a sum of 1367.5 million marks was voted for the construction of new ships, and was to be employed during the years 1901-1916. Inclusive of other special expenditure for shipbuilding, armaments, harbors, and dockyards. an additional amount of 1861 million marks was to be expended upon the navy during the sixteen years from 1901 to 1916: this expenditure was to be distributed as equally as possible between the different years. Only 761.13 millions were to be raised by means of loans, and the balance of 1099 millions was to be placed on the list of ordinary charges upon an annually increasing scale. In the Act of June 14th, 1900, which repealed the former Navy Act of April 10th, 1898, this new scheme came into force in a somewhat modified form. According to this Act, "the raising of the amounts necessary to the carrying out of this law is subject to an annual estimate in the list of the national expenditure." A part of the amount will be raised by the in-

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clusion of the sums in question in the General Supply List, while another part will be raised by means of loans. An increase in the Imperial Debt is accordingly to be anticipated for several years to come; the recent increase of the interest of the Debt is also traceable to the same cause. The Navy List, which is becoming such an important item of the national expenditure, shows the following development during the last 4 years (Budget figures):

NAVY LIST IN THOUSANDS OF MARKS.

	1898.	1899.	1900.	1901.
General expenses	62,751	69,045	73,863	79,878
Special expenditure in ordinary List	29,368	30,037	38,278	61,615
Special expenditure in extraordinary List	29,636	33,879	40,621	55,523
Total.....	121,755	132,961	152,762	197,016

These figures do not include the grants for disabled sailors. The grants in the Navy Estimates for the Chinese province of Kiautschau, which is subject to Admiralty administration, are likewise not included in the above figures.

The expenses of the East Asiatic Expedition were estimated at 152,770,000 marks in a supplement to the Navy Estimates for 1900, *i. e.,* for the period between the summer of 1900 and March 31st, 1901; in the Estimates for 1901, they were fixed at 123,322,000 marks, in view of the probable conclusion of the expedition. The whole forms a total of 276,092,000 marks. These sums are raised entirely by means of loans.

It thus appears that, during the last few years, both the navy and the foreign policy have contributed towards the augmentation of the German Debt in a considerable degree; for some time past the loans raised have been principally for military and naval expenses. In the Budget Act of 1900, a sum of 80,477,000 marks was devoted to paying off loans; together with the loan for the China Expedition, it amounted to 233,247,000 marks. In 1901, the corresponding sum was 203,304,000 marks, making altogether 436.5 millions. Moreover, the grants allowed by law in the Budget towards the diminution of the national debt were reduced in 1900 to 2,291,000 marks, and altogether cancelled in 1901, in order that they should be employed to meet special expenses, and so lessen the amount of new loans to be raised. But

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the revenues of the Empire, which have been hitherto steadily increasing, especially of late years, have on the other hand contributed to the maintenance of prosperous financial conditions. Only quite recently have signs of a decrease in the revenues appeared, in consequence of the general financial crisis.

Under the influence of the absorption of capital through the great impetus given of late years to industry and trade, the rate of interest in Germany rose slightly, while the price of Imperial and State papers sank. This was probably due in some measure also to the political events in Asia and South Africa. The average price of the 3½ per cent. Imperial Loans stood only at 95.82 in 1900, in comparison with 99.77 in 1899, 102.64 in 1898, 103.51 in 1897, and 104.57 in 1896: the lowest price was 92.75, at the end of September, 1900. The 3 per cent. Imperial Loans showed an average price of 86.74 in 1900, against 90.71 in 1899, 95.51 in 1898, 97.65 in 1897, and 99.12 in 1896. The lowest figure was 84.90 in October, 1900. Since that time, however, and especially since the spring of 1901, these prices have risen considerably: at the beginning of August, 1901, the 3½ Per Cents stood at 101-101.5, and the 3 Per Cents at over 92. The financial and industrial crisis, which depreciated the value of so many investments, has brought a great deal of capital back to Government securities.

In order to defray the expenses of the Chinese Expedition, a loan in the form of Treasury Bonds for 80 million marks was raised by arrangement with German banks in New York: this loan, for the first time for many years, was rated at 4 per cent. and stood at par. The negotiation of this loan abroad met with great opposition in Germany, but was justified by the prevailing tightness of the German money market. The loan has since partially returned into German hands.

It is important to note that a small portion of the Loans raised for military and naval purposes have been employed for other things; for instance, for the Post and Telegraph, the Imperial State Railways in Alsace-Lorraine, the North Sea Canal, subsidies to Hamburg and Bremen to enable them to enter the Zollverein, the currency reforms and so forth. The interest, etc., on these sums is partially covered by the receipts of the post and telegraph, State Railway and other departments; so that these debts are to a certain extent productive, a point not to be over-

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looked when examining the Imperial State Debt, as the net receipts of these departments have then to be taken into account.

The net profits of the Alsace-Lorraine Railway supply not only the interest on the sum at which the French railway was assessed as part of the War Indemnity, but also the interest on the capital expended by the Empire on the equipment and extension of the railway system; for neither working capital nor rolling stock was included in the cession of the line to Germany, and had to be provided at the expense of the Empire.

In the Budget of 1900, for instance, a surplus of 26.58 million marks was put down to the Imperial Railways, whereby more than one-third of the interest on the Imperial Debt is covered. Other net receipts—for instance, 1.87 million marks from the Imperial Printing Office taken over from Prussia and enlarged, and 47.07 million marks from the Imperial Post and Telegraph—amply suffice to cover the rest of the annual charges on the Imperial Debt, without counting the revenue from other sources, such as the share in the net profits of the Imperial Bank of Germany, which appeared in the Budget of 1900 as 9.70 million marks and was actually more.

It is thus clear that there is no necessity to tax the people in order to cover the interest on the Imperial Debt, an infinitely more favorable condition of things than in other countries.

This is without regard to the condition of the finances of the separate States, which happens, however, to be so favorable that even a very considerable increase in the Imperial Debt for military and naval purposes may be contemplated without the least apprehension.

The Imperial State Loans are all in the form of Rentes whereby the debtor, the Government, promises only the interest not definite repayment, but reserves the right to give notice of the repayment of the capital. The first loans which were placed between 1877 and 1884, according to the Laws of 1875 and 1884, were bearing 4 per cent. interest, and were issued at first a little below par, giving a return of 4.21 per cent., and gradually falling to 4.077; since 1880, owing to the improvement in State credit, higher quotations and lower interest on landed property, they rose steadily above par, while the return fell to 3.819 per cent. The continued low rate of interest in the money market enabled the Government in 1897 to give notice of the conversion of these

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loans and to lower the rate of interest to 3½ per cent. from October 1st, 1897—a measure which has proved entirely successful.

The subsequent Imperial Loans were placed at 3½ and 3 per cent., the former at or a little above par, the latter at first considerably below par (1886-87) but rising later almost to par (1897-98), thus giving a return of a little more than 3 per cent. The average price of issue of the 4 per cent. loans was 99.06, with 4.038 interest; of the 3½ per cent. loans, 101.10, with 3.462 interest; of the 3 per cent. loans, 95.53, with 3.140 interest.

Since then, that is since 1898 and especially since the summer of 1899, as everywhere else in Europe, the quotations for the German Imperial Loans and German State Loans generally have fallen considerably, owing to the tightness of the money markets, the South African War, and, in Germany especially, on account of the rapid expansion of industry and commerce and the consequent demands on capital and credit. The price of the German 3½ per cent. Imperial and State Loans, which had already reached 104 to 105½ (maximum 105.70 in 1896), has fallen to 95-96 (March, 1900), that of the 3 per cent. loans which had been above par (maximum 100.80 in 1894) to 86-87. The Empire and the States will therefore probably have to pay at least 3¾ per cent. for fresh loans.

The increase in the debt, particularly since 1887, and the fact —irrespective of the principle involved—that the greater part of the loans were applied to non-productive objects, have led of late years to provisions for the systematic amortization of the capital of the debt. Till then, no legal enactments existed for a sinking fund, nor was any portion of the Budget applied to this purpose. By a series of laws, provision has been made since 1896 whereby a portion of the Imperial Revenue derived from the customs and certain indirect home taxes shall be devoted—under certain conditions and to an amount specified in the regulation—to the amortization of the debt, or, if advisable, the credits voted by Parliament are reduced by the amount in question and thus some check put upon the increase of the debt. These enactments, which are closely connected with the somewhat intricate financial dealings between the Empire and the separate States, cannot be more fully entered into here. They appear somewhat too complicated as yet, but have nevertheless proved themselves useful in so far that they have retarded the increase of the Debt.

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Like most German State Loans, the Imperial Loan obligations are to bearer; they are issued in various amounts (mostly for 200, 500, 1,000, 2,000, 5,000 marks) and have half yearly coupons attached to them. In 1891, however, following Prussia's initiative, an "Imperial Book of the Debt" was instituted, to some extent, though not altogether, on the same lines as that of England. Entries are made there in favor of State creditors, the owners of Imperial Government Bonds handing them in for this purpose. The Bonds are thus converted into such entries and then destroyed; or *vice-versa,* entries can be re-converted into Bonds. A small charge is made for such transactions.

Treasury Bills have been issued periodically since 1876 to furnish the working capital of the Imperial Exchequer, and at times to a considerable amount for the purchase of the necessary gold for carrying out the currency reforms. They are invariably of short date (about 3 to 4 months), they are for large amounts, and, of late years, are without coupons, being negotiated like Bills at the current discount rates. It is now customary in the annual Budget to assign to the Imperial Chancellor a maximum credit in Treasury Bills. These Bills may be issued repeatedly during a certain period, but must be paid off by a specified date. The necessity for this operation explains itself, from the fact that State revenue and State outlay do not always correspond within the exact period of the year.

The "*Reichscassenscheine*" are an institution peculiar to Germany and a few other countries. They are an Imperial Paper Money, having their origin in the paper money issued, before 1871, almost universally by the separate States, the smaller States issuing it in relatively high amounts, considering their area and population. In this way, a loan was raised on which there was no interest; for, though the paper money was for the most part exchangeable for coin on demand, this was seldom done, as it was taken in payment in every public office in every State, hence there was no call for large redemption funds, and in the old days of the silver currency it was a convenient form of circulation besides the coin. The great drawback, however, to this paper money, was its confusing multiplicity.

Conformably with the Constitution of the North German Confederation and of the German Empire, the Imperial Legislature had now become the only authority competent to deal with this

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as with all other questions pertaining to currency or banking. This was settled in the law of April 30th, 1874. All paper money of the various States was recalled, the total slightly reduced in value and converted into the new Imperial paper money, the "*Reichscassenscheine.*"

At first there remained over, of the 180.30 million marks of State paper money, a sum of 174.89 million marks in "*Reichscassenscheine,*" which, however, was to be reduced by yearly withdrawals down to 1890 to a definite limit of 120 million marks. To this amount the Imperial paper money is still in circulation, consisting of 20 million marks in amounts of 5 marks, 30 millions in amounts of 20 marks, and 70 millions in amounts of 50 marks. The Imperial paper money need not be accepted by private persons in lieu of coin and is not legal tender, but is received in payment by public offices throughout the Empire where they are also cashed at the request of the holder. The weak point in the scheme is that there is no special cash reserve for their redemption, nor any other liquid assets for this purpose, and, though in ordinary times their exchange for ready money is seldom asked for, it might easily be different at critical times. It would have been wiser to have boldly abolished the State paper money at the time when the French War Indemnity offered ample means for so doing, or at least to have allowed the Imperial Bank to issue 50 mark notes, its lowest being now 100 marks, especially as with the present gold currency there is no real necessity for amounts of five or twenty marks.

The Imperial Bank of Germany, which was developed out of the former Bank of Prussia, is not a State Bank, as its capital (formerly 120 million marks, but now being increased) belongs exclusively to private individuals. Nevertheless, as in the case of the old Bank of Prussia, the management is entirely in the hands of the State, the bank notes are issued under State control, the Empire has a share in the net profits of the Bank, and has the right, on the lapse of the concession, to take over the Bank.

The management of the Imperial Debt is undertaken by the Administrative Committee of the Prussian State Debt, for which Prussia receives re-imbursement. The charges of administration of the Imperial Debt for 1899 were 280,000 marks. "The Imperial Debt Commission," in which the Reichstag has representatives, acts as a Board of Control.

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Pensions, whether military (army and navy) or civil, are not reckoned in the actual State Debt, either of the Empire or the separate States, as is the case, for instance, in France. Broadly speaking, however, they may be regarded in the light of a debt. The sum total for 1899 came to 93.23 million marks, 91.78 million of which go to the army and navy, the remainder to the pensions for Government officials. The greater part of the military pensions, however, does not fall on the Imperial Budget, but is supported by a special institution, the "Imperial Fund for Disabled Soldiers."

This Fund, with a few others, was formed out of the French War Indemnity, with a capital of 561 million marks, in order to insure pensions for the soldiers disabled in the war of 1870, though later on pension funds from former wars were incorporated in it. The Fund is invested in German Government and other loans, and, besides the interest, part of the capital itself is used, if necessary, to meet the yearly liabilities of the Fund. In this way, the capital has shrunk considerably in the course of years. The Fund is larger than it actually need be, for the payment of the pensions for which it is responsible, and therefore represents, in a manner, a free asset of the Empire. All other pensions are paid out of the general resources of the Budget. The possession by the Empire of a free asset in the shape of the War Pensions Fund is a fact to be noted in an appreciation of the German National Debt.

Other Funds were constituted at that time out of the French War Indemnity—for instance a Fortifications Fund of 216 million marks—long since absorbed, and one of 24 million marks for the Reichstag buildings, of which only 0.57 million marks remained in 1898. On the other hand, very considerable assets still remain to the Empire out of the French War Indemnity, in the value of the Alsace-Lorraine Railway, which at present yields an annual net profit of 26 to 27 million marks, representing a capital sum of 500 million marks or more.

Then there is the "War Chest," the National War Fund of 120 million marks in gold, also raised from the French Indemnity, an institution almost exclusively peculiar to Germany, and a development of the former Prussian State Reserve which dated from the time of Frederick William the First in the earlier part of the eighteenth century. This Prussian State Reserve had

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last done service in the wars of 1866 and 1870, especially for the rapid mobilization of the troops, Prince Bismarck himself stating in the Reichstag in 1871 that without this source of ready money the mobilization of the army, in the summer of 1870, must necessarily have been delayed, and the war, instead of being carried at once into the enemy's country, might have easily begun on the Rhine.

As a result of this opinion, the old Prussian State Reserve was transferred to the Empire in 1871. It had last been officially regulated in 1866, when a maximum limit of 30 million thalers (90 million marks) was fixed, which sum was obtained out of the war contribution from Austria and the South German States. These 30 million thalers were now refunded to Prussia, she abolished her State Reserve, and the Empire founded the present "War Chest" of 120 million marks, which is stored in gold coins in the Julius Tower of the Fortress of Spandau. As its sole purpose is for the mobilization and arming of the troops in time of war, it has never been touched since its creation in 1871-72. The Empire, of course, loses the interest on this dead capital, but enjoys in return the inestimable advantage of being able to command an immediate supply of ready money on the outbreak of a war. Only, the Fund should be larger to satisfy latter-day requirements.

The 120 million marks of the "War Chest" is the same sum as that issued in Imperial paper money, so that hereby the Empire gains the interest it loses on the dead capital. Beyond this, however, the correspondence in the two sums is purely accidental. Nor is the "War Chest," as is often erroneously supposed, a security for the *Reichscassenscheine*. That, as we know, is not its mission at all, which is exclusively to cover the expenses entailed in mobilizing the army. Nevertheless, in war time it may be used to increase the cash of the Imperial Bank of Germany and thus place a corresponding amount in bank notes at the disposal of the army. In this way the War Chest may be accounted an additional security for the public credit.

In discussing the National Debt or any other financial question of the German Empire as now constituted, the Empire itself must be kept distinct from its separate component States. Nevertheless, the debts and finances of the Empire and those of the separate States are so closely interwoven that, to treat of the

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Empire by itself, would necessarily create a false impression, especially when instituting comparisons with countries like France, Great Britain, Russia, Italy, where no such division obtains.

Thus, in the German Imperial Budget, the chief outlay is for army and navy, while only a small portion falls to the Civil List, because the civil administration has remained for the most part in the hands of the separate States. Post and telegraph belong to the Empire, excepting in Bavaria and Wurtemberg, which have retained their own. Most of the railways, certainly all the important lines, are Government property; but of these only a small proportion—the Alsace-Lorraine line—belongs to the Empire, the rest falling to Prussia and the other States.

Hence, while in the National Debt of the German Empire can only be reckoned such loans as were and still are raised for defraying the expenses of army, navy, Imperial Post, and the above mentioned railway, those dating from 1866 (in North Germany) and 1871 (South Germany), as also the debts incurred for the construction of State railways and the purchase of private lines, must be reckoned in the State debt of each separate State concerned. In the Budget of the various States the gross receipts of the railways come under State Revenue, their working expenses under State Outlay, the net profits furnishing not only the interest, and eventually the means for the repayment of the loans originally raised for this purpose, but, particularly in Prussia, a surplus over and above which goes to cover other public expenditure.

Only by taking these circumstances into consideration, differing, as they do, so essentially from those of France and England, is it possible for a foreigner to understand the German National Debt and Finances, and to compare them with those of other countries. In the present review, it will suffice to consider Prussia in contradistinction to the Empire, and a separate paper will be devoted to that purpose.

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